

Woodsmith
CUSTOM WOODWORKING

Power Tool Upgrades



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WOODSMITH CUSTOM WOODWORKING

Power Tool Upgrades



SHOP SAFETY IS YOUR RESPONSIBILITY

Using hand or power tools improperly can result in serious injury or death. Do not operate any tool until you read the manual and understand how to operate the tool safely. Always use all appropriate safety equipment as well as the guards that come with your tools and equipment and read the manuals that accompany them. In some of the illustrations in this book, the guards and safety equipment have been removed only to provide a better view of the operation. Do not attempt any procedure without using all appropriate safety equipment or without ensuring that all guards are in place. Neither August Home Publishing Company nor Time-Life Books assume any responsibility for any injury, damage or loss suffered as a result of your use of the material, plans or illustrations contained in this book.

WOODSMITH CUSTOM WOODWORKING

Power Tool Upgrades

By the editors of *Woodsmith* magazine

Time-Life Books

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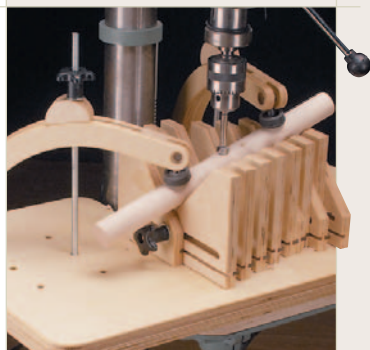
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DRILL PRESS

When it comes to the drill press, if all you think of is a machine for drilling holes, then the projects in this section should open your eyes to the untapped potential of an under-utilized tool.

For example, did you ever think of using your drill press to turn a slow-speed sharpening wheel? It's an easy way to get a razor-sharp cutting edge. Plus there's none of the concern about damaging a tool from over-heating.

Or pair up a simple fence with a shop-made sanding drum to transform any drill press into a thickness sander.

Of course, you should still be able to use the tool to drill holes. So a tilting table makes it easier to make angled holes, and an infinitely adjustable V-block helps when drilling into oddly-shaped items like turned vessels or table legs.

And every project in this section works better if your tool has a solid foundation. For a benchtop drill press, you won't find one sturdier than our stand. It's mobile to save space and there's even storage for bits and accessories.

Drill Press Stand

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Drill Press Stand

Made with “two-by” stock, this roll-around stand provides a rock-solid platform for your benchtop drill press. Three pull-out trays keep lots of bits and accessories organized and at your fingertips.



One of the best ways to maximize space in any shop, large or small, is to make your tools mobile. That way, they can be rolled out of the way when they're not needed.

But most roll-around tool stands are like four-year-old kids — they won't sit still. Even when you lock the casters, the tool stands still have a tendency to “creep” around the shop as you use the tool.

But this roll-around stand for your benchtop drill press won't budge an inch

when you're using it. That's because it has a set of special casters on the bottom that lock both the wheel and the shaft.

Getting the stand to stay put was one thing. But I was also concerned it might be top-heavy and have a tendency to tip when being rolled around. (Especially since my drill press weighs in at 150 lbs. — and most of that weight is in the motor, which is quite high up.)

SANDBOX. The solution was to offset the weight of the drill press by designing

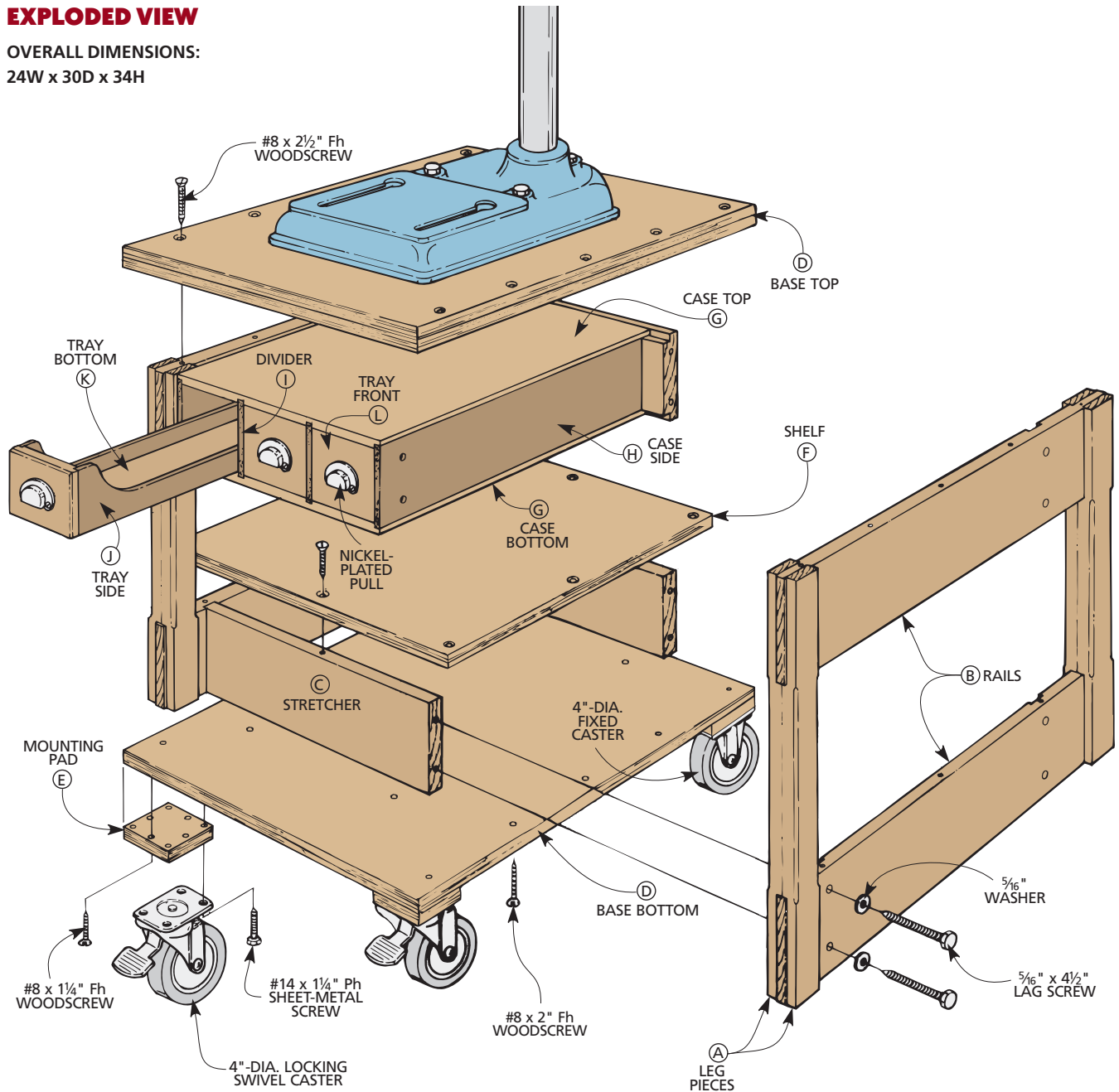
a box into the lower part of the stand. This box can then be filled with ballast — about 100 lbs. of sand, in my case.

STURDY BASE. To support the combined weight of the sand and the drill press, the stand needs to be rigid and strong. So it's made of “two-by” Douglas fir and 3/4"-thick Baltic birch plywood.

STORAGE. There's also plenty of storage. Pull-out trays organize drill bits and small accessories. And an open shelf below provides easy access to large items.

EXPLODED VIEW

OVERALL DIMENSIONS:
24W x 30D x 34H



MATERIALS LIST

WOOD

A Leg Pieces (8)	1 1/2 x 3 - 26
B Rails (4)	1 1/2 x 6 1/2 - 29 1/4
C Stretchers (3)	1 1/2 x 6 1/2 - 19
D Base Top/Bottom (3)	3/4 ply - 30 x 24
E Mounting Pads (4)	3/4 ply - 4 x 4
F Shelf (1)	3/4 ply - 22 x 22 1/2
G Case Top/Bottom (2)	3/4 ply - 24 1/4 x 17
H Case Sides (2)	1/4 hdbd. - 5 3/4 x 23 1/2

I Dividers (2)

1/4 hdbd. - 5 3/4 x 23 1/2

J Tray Sides (6)

1/4 hdbd. - 4 15/16 x 23 1/8

K Tray Bottoms (3)

3/4 ply - 4 3/4 x 23 1/8

L Tray Front/Back (6)

3/4 ply - 4 15/16 x 5 1/4

HARDWARE SUPPLIES

(20) No. 8 x 1 1/4" Fh woodscrews
(25) No. 8 x 2" Fh woodscrews
(10) No. 8 x 2 1/2" Fh woodscrews

(16) No. 14 x 1 1/4" Ph sheet-metal screws
(12) 5/16" x 4 1/2" lag screws
(12) 5/16" flat washers
(3) Nickel-plated pulls w/ screws
(2) 4"-dia. fixed casters
(2) 4"-dia. locking swivel casters
(1) Package of 100 wire brads (1" long)

Note: Also need lag screws and washers to secure drill press to stand.

BASE

I began work by making a sturdy base to support the drill press. It consists of a “two-by” frame and a top, bottom, and shelf made from $\frac{3}{4}$ " plywood.

FRAME. The frame starts out as two side assemblies (*Fig. 1*). Each of these assemblies is made up of two 3"-thick legs and a pair of wide rails. The pieces are held together with mortise and through tenon joints (*Fig. 1*).

But you don't have to worry about drilling these mortises. That's because they're formed by cutting a $6\frac{1}{2}$ "-wide rabbet $\frac{1}{2}$ " deep in each end of the leg pieces (A). Then two leg pieces are glued up with the rabbets facing each other to create the open mortise (*Fig. 2*). To keep these pieces aligned during glue-up, I drove a couple of brads into one piece of each pair and snipped off the heads.

That's about all there is to making the legs. When the glue dried, I routed a stopped chamfer on all four corners to ease the sharp edges (*Fig. 2a*).

RAILS. The next step is to add the rails (B) (*Fig. 1*). A tenon on the end of each rail extends all the way through the leg and sticks out $\frac{1}{8}$ " in front and back.

Why use a through tenon? Because it's easier to cut the tenons a bit “long” and let them stand proud than to get them perfectly flush with the front of the leg.

Before gluing up the end assemblies, there are two things to do. First, the ends of the tenons are chamfered (except for the part that will rest against the top or bottom of the mortise). Second, you'll need to cut dadoes in the rails for stretchers that are added next (*Fig. 2a*).

STRETCHERS. The stretchers (C), connect the two side assemblies. To create an opening for a case that holds the trays, a stretcher runs across the top. And two more stretchers span the bottom. The bottom stretchers, the rails, and a plywood bottom form a box for the sand.

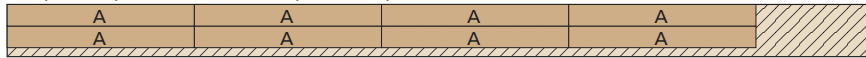
Although the stretchers are the same size, there is one difference. The upper stretcher is rabbeted along the top and bottom inside edges (*Fig. 1a*). These rabbets provide a surface that will allow you to secure the back end of the case that holds the trays.

ASSEMBLY. Now it's just a matter of fitting the stretchers between the end assemblies and screwing them in place. (I used lag screws.)

TOP AND BOTTOM. With the basic frame complete, I added a plywood top

CUTTING DIAGRAM

2x8 ($1\frac{1}{2}$ x $7\frac{1}{4}$) - 120 DOUGLAS FIR (9.4 Bd. Ft.)



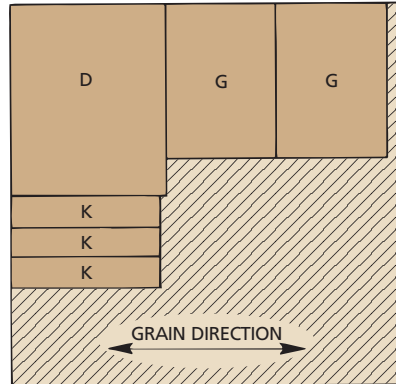
2x8 ($1\frac{1}{2}$ x $7\frac{1}{4}$) - 96 DOUGLAS FIR (7.5 Bd. Ft.)



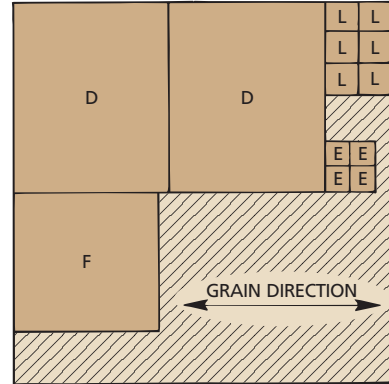
2x8 ($1\frac{1}{2}$ x $7\frac{1}{4}$) - 96 DOUGLAS FIR (7.5 Bd. Ft.)



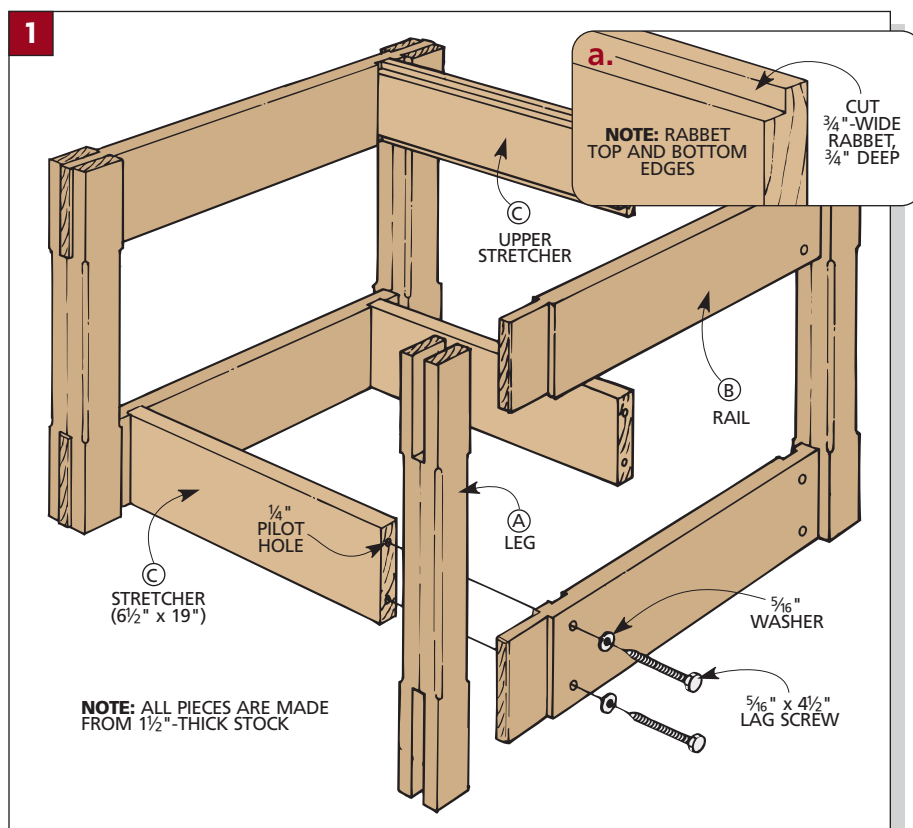
$\frac{3}{4}$ " BALTIC BIRCH PLYWOOD - 60 x 60



$\frac{3}{4}$ " BALTIC BIRCH PLYWOOD - 60 x 60



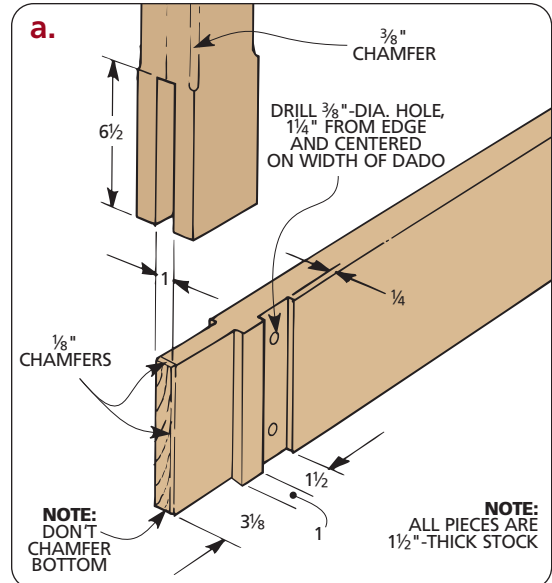
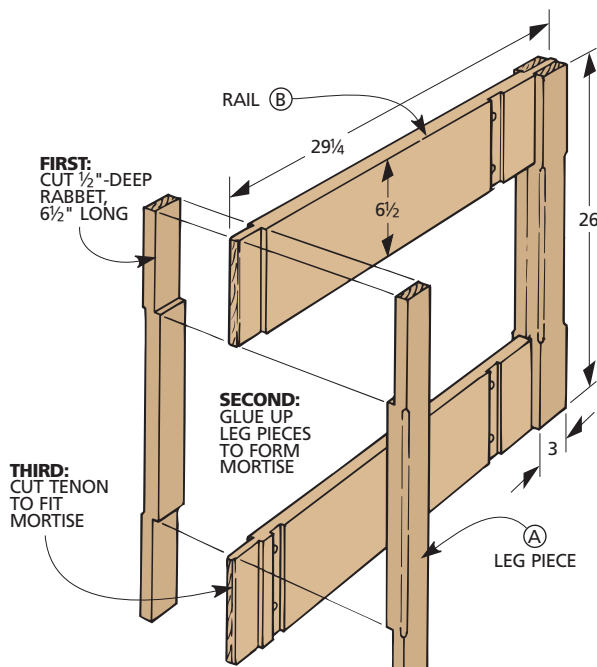
NOTE: ALSO NEED A 48" x 48" SHEET OF $\frac{1}{4}$ " HARDBOARD FOR PARTS H, I, AND J



and bottom (D). These pieces are the same size. But since my drill press is quite heavy, I “beefed up” the top by gluing up two layers of plywood.

Next, I routed $\frac{1}{8}$ " chamfers around the edges of the top and bottom (*Figs. 4a and 4b*). Then center the top on the base and screw it in place.

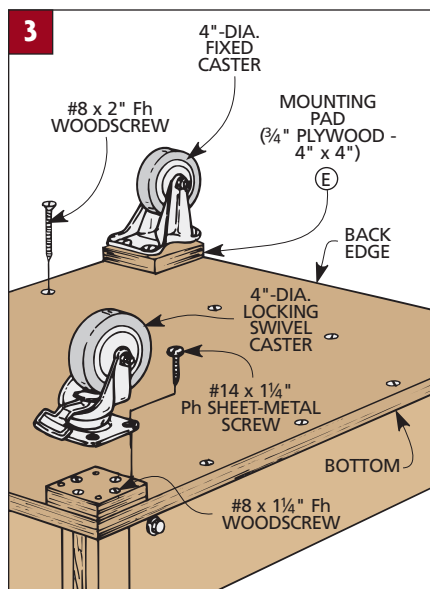
2



The bottom is also attached with screws (Fig. 3). But first, you'll have to turn the base upside down. This is also a good time to attach the mounting pads (E) for the casters with glue and screws.

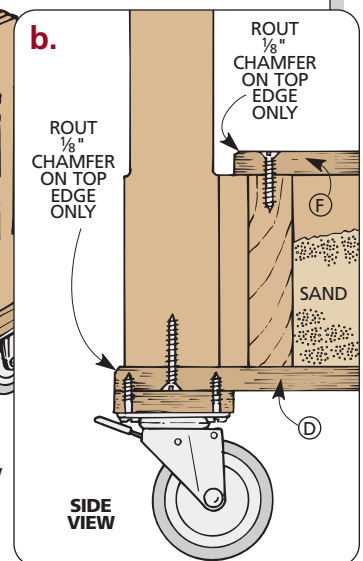
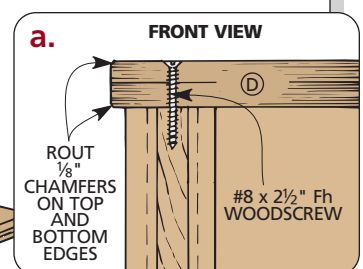
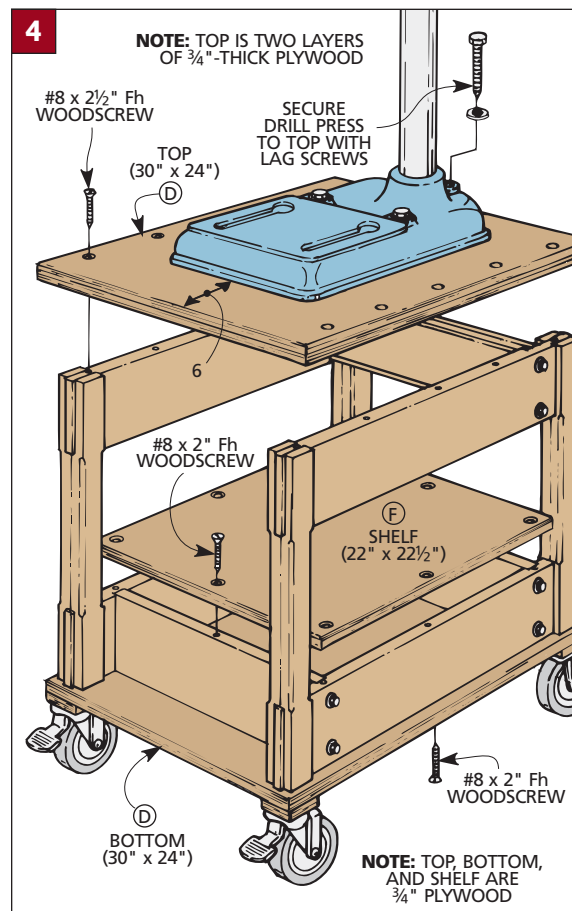
CASTERS. To make the base easy to roll around, I mounted locking swivel casters along the front edge and fixed casters in back (Figs. 3 and 4).

FILL SANDBOX. After setting the base on its casters, I filled the "sandbox" with sand. This provides extra ballast that helps offset the weight of the drill press and keeps the base from tipping. To provide storage underneath (and enclose the sandbox), add a plywood shelf (F).



MOUNT DRILL PRESS. With the shelf screwed in place, all that's left is to mount the drill press securely to the top of the base. (I used lag screws and washers.) If there's room, position the base of the

drill press 6" in from the front edge of the top (Fig. 4). This provides room to set workpieces or one of the drill bit trays (refer to the next page) on top of the stand while you work.



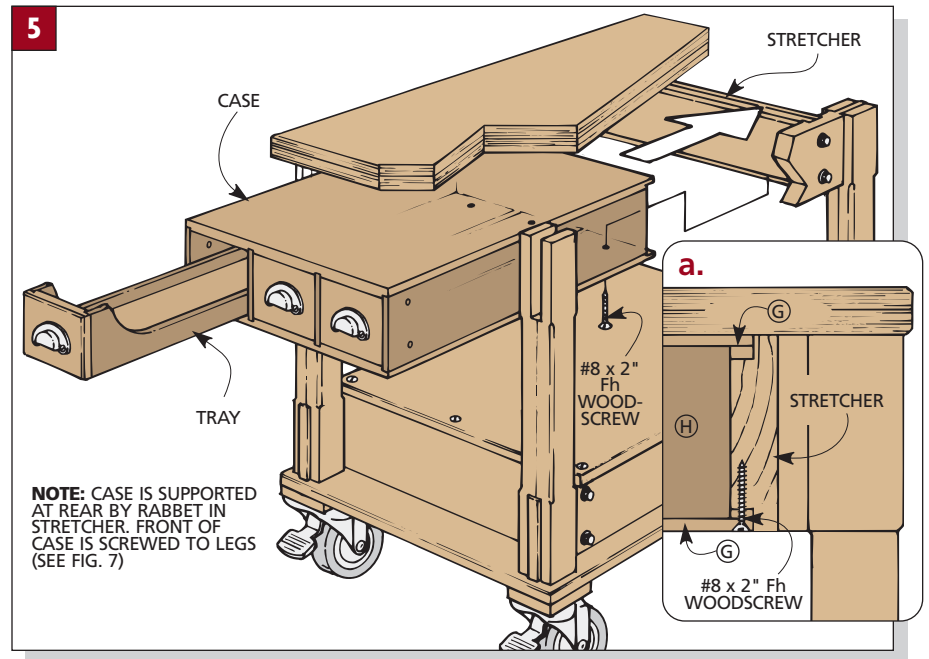
CASE

The base does more than provide a sturdy mounting platform for the drill press. It also houses a case with three pull-out trays that keep your drill bits and accessories organized (*Fig. 5*). The case is just an open-ended box with compartments for the three trays.

TOP AND BOTTOM. I began by making a plywood top (G) and bottom (G) for the case (*Fig. 6*). One thing to note here is the top and bottom are sized to extend $\frac{3}{4}$ " past the sides of the case in the back. (All the case pieces will be flush at the front.) This forms two lips at the back that fit in the rabbets in the upper stretcher (*Fig. 5a*). Besides helping to support the case, these lips provide a way to attach it to the base later by driving screws through the bottom of the case.

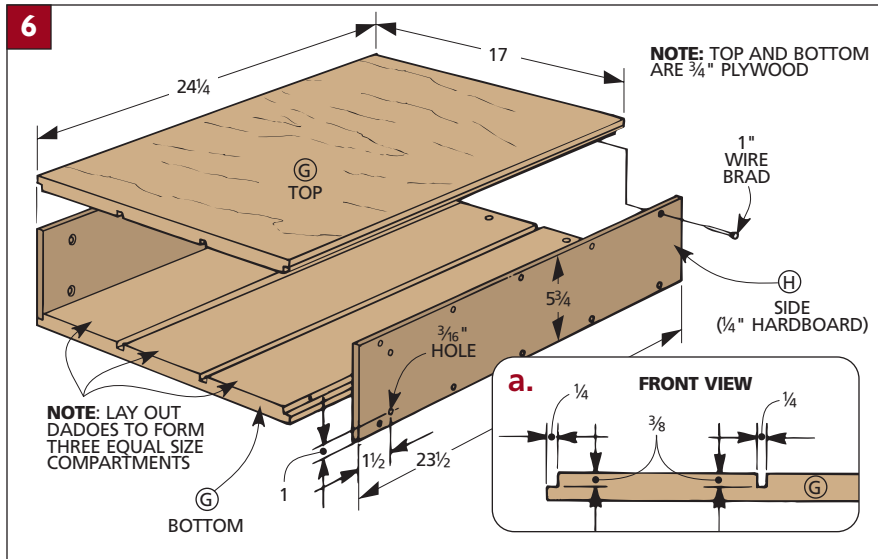
After cutting the top and bottom to size, the next step is to cut $\frac{3}{8}$ "-deep rabbets in the two long edges of each piece. These rabbets will accept $\frac{1}{4}$ " hardboard sides that are added later (*Fig. 6*).

In addition to the rabbets, you'll also need to cut two dadoes in each piece for



a pair of dividers that separate the case into compartments (*Fig. 6a*).

Note: When laying out these dadoes, the goal is to end up with three identically-sized compartments.



SIDES. Now you're ready to add the sides (H) of the case (*Fig. 6*). These are pieces of $\frac{1}{4}$ " hardboard that hold the top and bottom together. Remember, they're cut to length so they'll sit back $\frac{3}{4}$ " from the back edge of the top and bottom.

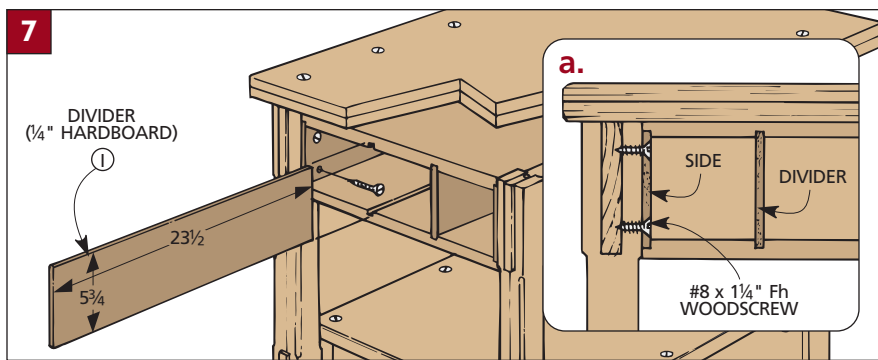
To make it easy to screw the case in place later, it's best to drill two shank holes near the front end of each side now (*Fig. 6*). Then just glue and tack the sides in place with short brads.

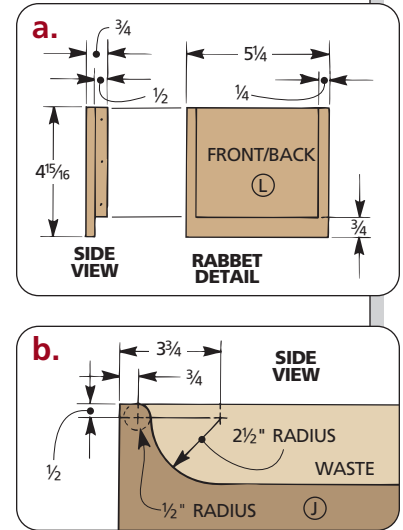
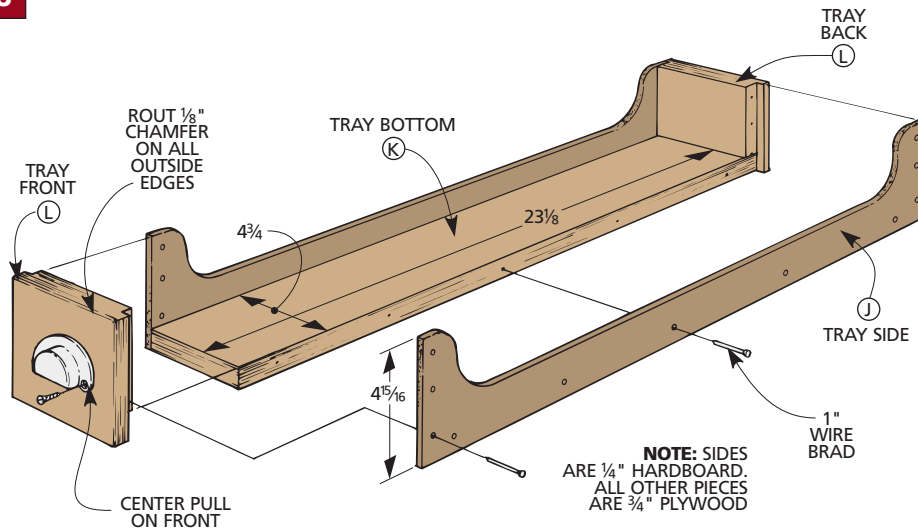
INSTALL CASE. At this point, you can install the case. What you want to do here is slide it all the way into the base until the top and bottom fit into the rabbets in the upper stretcher. With the top resting on the ledge formed by the rabbet, screw the sides to the front legs (*Fig. 7a*). Then secure the bottom with three screws into the stretcher (*Fig. 5a*).

DIVIDERS. Now all that's left is to add a pair of dividers (I) to form the compartments for the trays (*Fig. 7*). The dividers are cut from $\frac{1}{4}$ " hardboard to fit between the dadoes in the top and bottom. To install them, I applied a few drops of glue to the front portion of the bottom dadoes. Then, as the dividers are slid into place, they distribute the glue along the length of the dado.

TRAYS

At this point, the case is complete, so you can turn your attention to the trays. Basically, these are long, narrow boxes that fit into the openings in the case, like a row of post office boxes.





These trays are designed to allow easy access to drill bits and other accessories. And for real fingertip convenience, all you have to do is pull one out and set it on top of the Drill Press Stand.

SIDES. The first parts to make are the sides (J). These pieces are cut from $\frac{1}{4}$ " hardboard. A "scoop" on the top edge of each one provides clearance as you reach in and take out a drill bit (Fig. 8b).

TRAY BOTTOM. The bottom (K) of the tray is $\frac{3}{4}$ " thick. (I used plywood.) This way, you can drill stopped holes in it to hold plug cutters, sanding drums, or your circle cutting bit. (For more information on custom drill bit holders, see the Designer's Notebook below.)

FRONT AND BACK. To enclose the ends of each tray, I added a front and back (L) made from $\frac{3}{4}$ " plywood (Fig. 8). Cut a

pair of narrow rabbets to accept the sides of the tray. The bottom of the tray fits in a wider rabbet (Fig. 8a).

ASSEMBLY. After cutting the rabbets, rout $\frac{1}{8}$ " chamfers around the outside edges of the front and back. Then the trays are simply glued and tacked together (Fig. 8). Finally, attaching a nickel-plated pull to the front of each tray provides the finishing touch. ■

DESIGNER'S NOTEBOOK

Keep tall and short bits organized with custom holders.

CONSTRUCTION NOTES:

■ To take full advantage of the space inside the trays, you can customize each one to fit drill bits and accessories.

■ This is easy for short bits and sanding drums that can stand upright in the tray. Just drill shallow holes in the bottom of the tray to fit the bit or the shank of the sanding drum (see drawing).

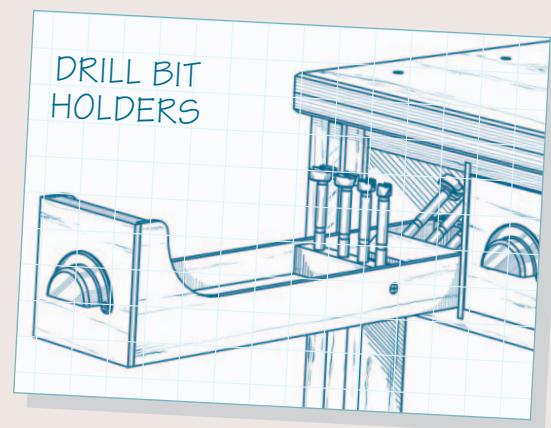
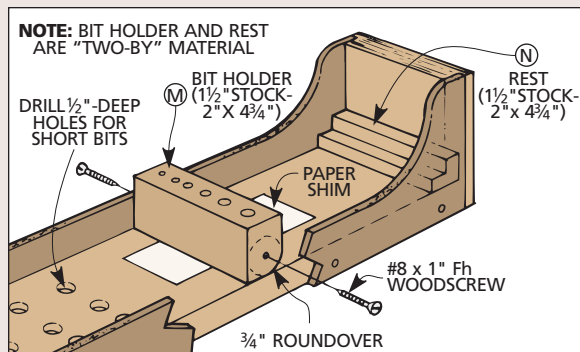
■ For long bits, make a bit holder (M) that tilts up when you want to remove a bit and that lies flat for storage.

To keep the holder from rubbing against the bottom of the tray, rout a roundover on one of the bottom corners

(see drawing). Leave the opposite corner square to form a "stop" that keeps the holder upright.

Note: A temporary paper shim below the holder provides clearance to allow it to pivot easily.

■ Drive a screw through each side of the tray to secure the holder in place. (Countersink the heads so the tray closes.)



■ For spade bits, make a notched rest (N) to support the tips (see drawing). Glue it to the front of the tray.

MATERIALS LIST

NEW PARTS

M Bit Holder (1)	$1\frac{1}{2} \times 2 - 4\frac{3}{4}$
N Rest (1)	$1\frac{1}{2} \times 2 - 4\frac{3}{4}$

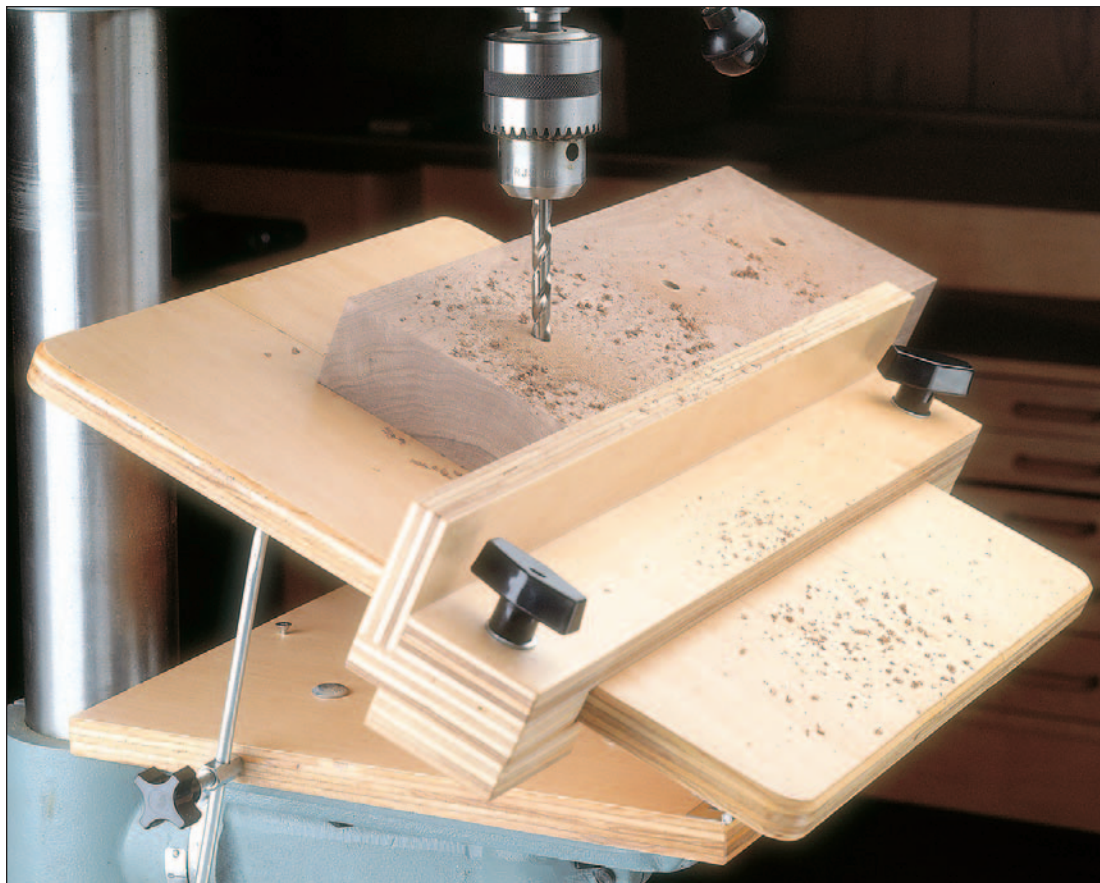
HARDWARE SUPPLIES

(2) No. 8 x 1" Fh woodscrews

Note: Materials listed are for one bit holder.

Tilting Table

Drilling a hole at an angle on the drill press used to be a hit and miss operation. This tilting table makes it easy to position a workpiece at an angle under the drill bit. A locking fence keeps it in position.



Drilling angled holes on a drill press can be a real pain. Usually, you have to reach under the table and use a wrench to loosen a bolt. Then you have to set the angle of the drill press table with one hand and retighten the bolt with the other. And if your angle needs to be precise, you'll need a third hand to hold a protractor against the bit while you do this.

I knew there had to be an easier way. As I thought about it, I came up with the idea for a separate table that adjusts easily. And as the design developed, I discovered this simple table would have several advantages over the existing metal table.

First, the Tilting Table can be pivoted. So depending on the size of the workpiece and the location of the hole, you can tilt the table from front to back or side to side. Plus, the table will lie flat when you need to drill vertical holes.

FENCE. Workpieces on an angled surface need to be held in place somehow. With the stock metal drill press table, it can be tough getting clamps to the workpiece. And the irregular surface on the bottom of the table can make it difficult to get a clamp to grip tightly.

On the Tilting Table, the plywood top provides a smooth surface for clamping. There's also a simple fence that locks

onto the table to allow you to clamp pieces to it. And because the table is square, the fence can be positioned from side to side or front to back.

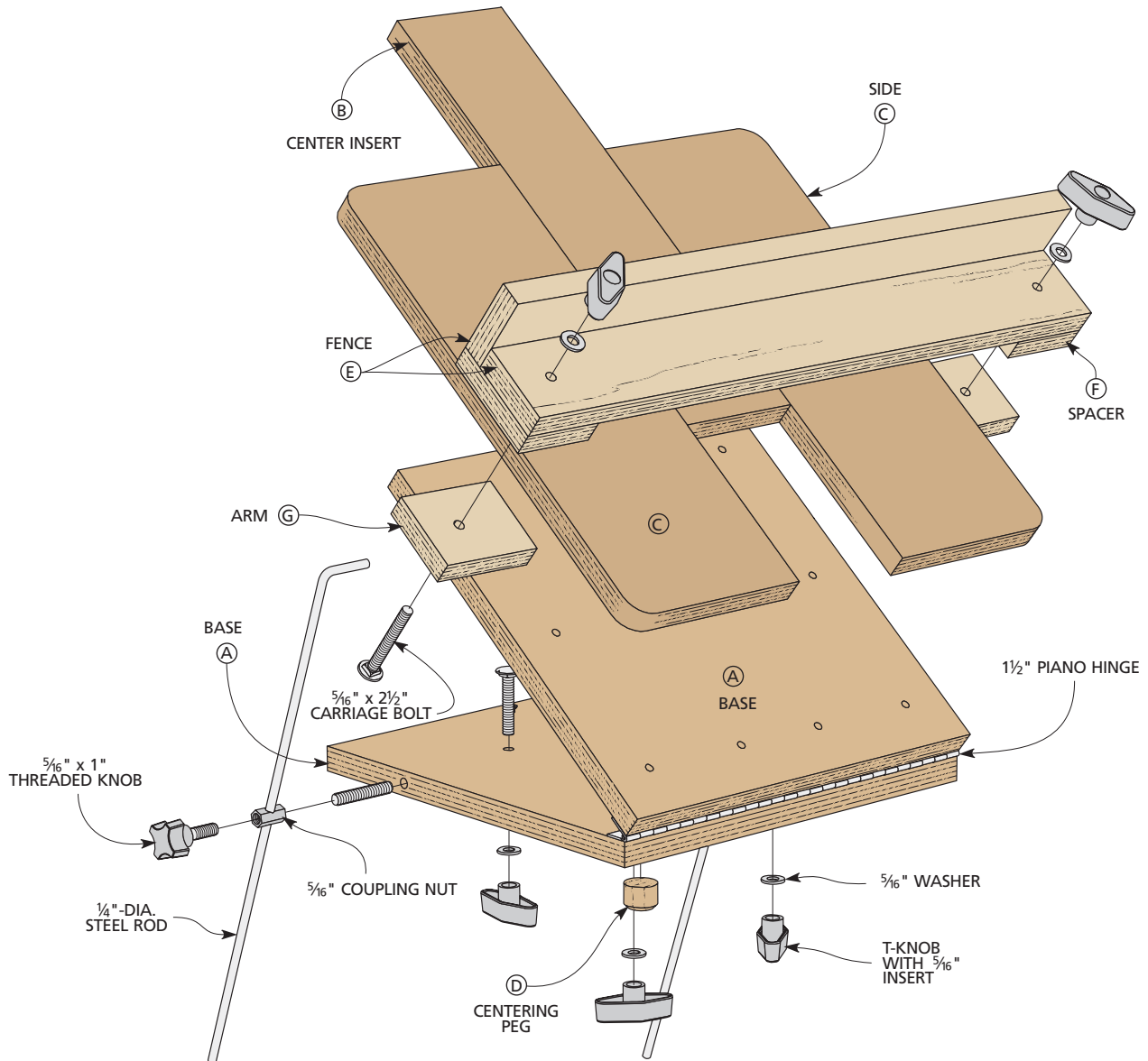
PLYWOOD. Construction of this table is simple. Almost all the pieces are $\frac{3}{4}$ " plywood. (You'll only need a quarter-sheet.) The table is just two pieces fastened together with a piano hinge. A shop-made support system locks the table at the angle needed. And the fence and its clamping system are also plywood.

Most of the hardware is readily available at hardware stores. You may need to order the threaded knobs for the fence. Some sources are listed on page 126.

EXPLODED VIEW

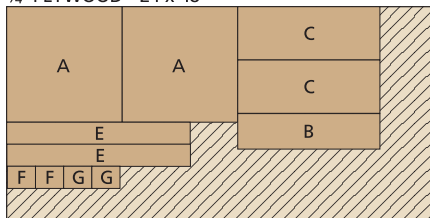
OVERALL DIMENSIONS:

21 $\frac{1}{8}$ "W x 16D x 5 $\frac{1}{8}$ "H (20 $\frac{1}{8}$ "H INCLUDING RODS)



CUTTING DIAGRAM

$\frac{3}{4}$ " PLYWOOD - 24 x 48



NOTE: ALSO NEED A SHORT PIECE OF DOWEL (SIZED TO FIT DRILL PRESS TABLE) FOR PART D

MATERIALS LIST

WOOD

A Base (2)	$\frac{3}{4}$ ply - 13 x 13
B Center Insert (1)	$\frac{3}{4}$ ply - 4 x 16
C Side (2)	$\frac{3}{4}$ ply - 6 x 16
D Centering Peg (1)	Custom-size dowel x $\frac{3}{4}$
E Fence (2)	$\frac{3}{4}$ ply - 2 $\frac{1}{2}$ x 21 $\frac{1}{8}$
F Spacer (2)	$\frac{3}{4}$ ply - 2 $\frac{1}{2}$ x 3 $\frac{1}{4}$
G Arm (2)	$\frac{3}{4}$ ply - 2 $\frac{1}{2}$ x 3 $\frac{1}{4}$

HARDWARE SUPPLIES

(1) No. 8 x $\frac{3}{4}$ " Fh woodscrew

(10) No. 8 x 1 $\frac{1}{4}$ " Fh woodscrews

(4) No. 8 x 2" Fh woodscrews

(4) $\frac{5}{16}$ " x 1 $\frac{3}{4}$ " carriage bolts

(4) $\frac{5}{16}$ " x 2 $\frac{1}{2}$ " carriage bolts

(4) $\frac{5}{16}$ " x 1 $\frac{5}{8}$ " fender washers

(2) $\frac{5}{16}$ " flat washers

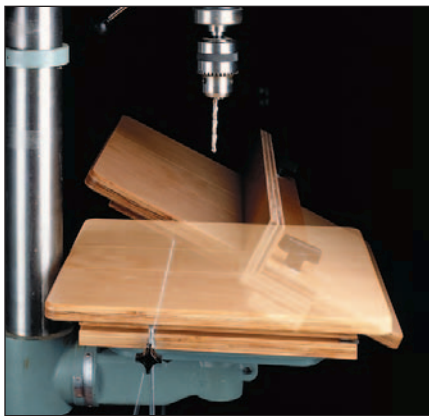
(6) T-knobs w/ $\frac{5}{16}$ " inserts

(6) $\frac{5}{16}$ " x 1" threaded knobs

(2) $\frac{5}{16}$ " coupling nuts

(1) 1 $\frac{1}{2}$ " x 13" piano hinge w/ screws

(2) $\frac{1}{4}$ " dia. x 18" steel rods



Adjustable to any angle, this table makes it easy to drill angled holes in pieces. The adjustable fence helps hold workpieces in position while drilling.

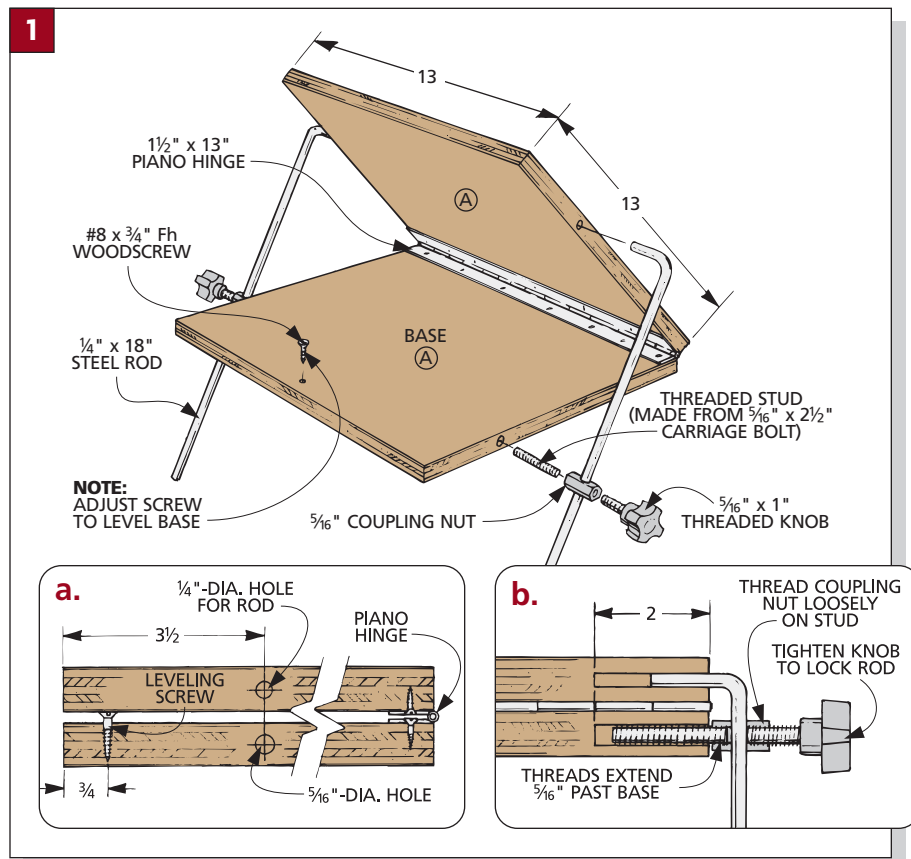
BASE

The table consists of two parts: an adjustable base and a top that's added later. The base is made up of two square pieces of $\frac{3}{4}$ " plywood held together with a piano hinge (Fig. 1).

DETERMINE SIZE. The size of the base pieces (A) will vary depending on the capacity of your drill press. For example, on my 16" drill press, I can drill to the center of a 16"-wide workpiece. This means the distance from the column to the center of the bit is at least 8".

Once this is determined, the two base pieces are cut 3" smaller than the capacity of the drill press. (So in my case, the base pieces are 13" square.)

After cutting the pieces to size, install the piano hinge along one edge. The hinge is just surface-mounted. So to compensate for the thickness of the hinge,



add a flathead "leveling" screw at the opposite side of the base (Fig. 1a).

SUPPORT SYSTEM. Once the base is assembled, the next step is to add a support system to lift and secure the table at the desired angle.

This system consists of two 18"-long steel rods. (These can be found at most hardware stores.) One end of each rod is bent at a 90° angle. To do this, clamp the first 1 1/2" of the rod in a machinist's vise.

Then just bend the rod over and use a hammer to get a sharp angle (Fig. 2).

The bent end is inserted in a 1/4"-dia. hole drilled in the side of the top base piece (Figs. 1a and 1b).

The key to the support system is finding a way to hold the rod in place when the table is tilted. I solved this problem with a coupling nut.

COUPLING NUT. The coupling nut serves two purposes. First, by drilling a hole through the nut, the rod can slide up and down as the table is tilted (Fig. 3). (See the Shop Tip at left for more about drilling this hole.)

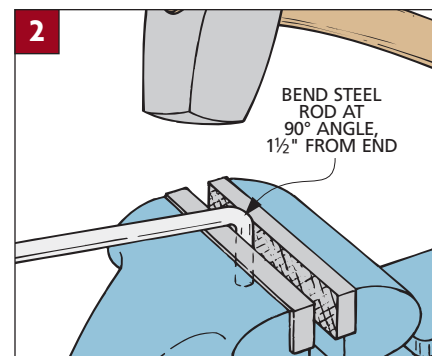
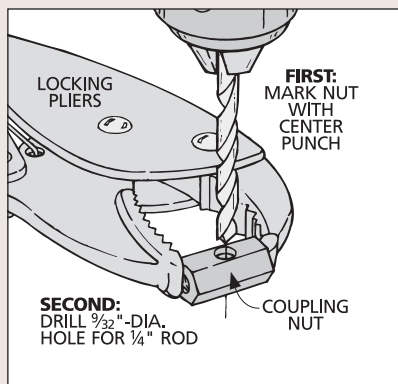
The nut also acts as a pivot, allowing the angle of the rods to change as the table is moved up and down.

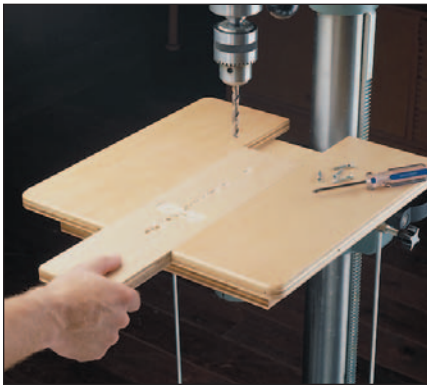
SHOP TIP Drilling Metal

To allow the support rods to slide through the coupling nuts, a hole slightly larger than the rod is drilled through each nut.

To do this, grip the coupling nut in a pair of locking pliers. Then mark the point where the hole will be drilled with a center punch. This provides an indentation for the drill bit to start in so it won't wander.

Before drilling the nut, clamp the locking pliers to the drill press table.





The insert in the table is designed to see action. Use it to back up holes to prevent chipout. It slides out for easy replacement as it gets chewed up with use.

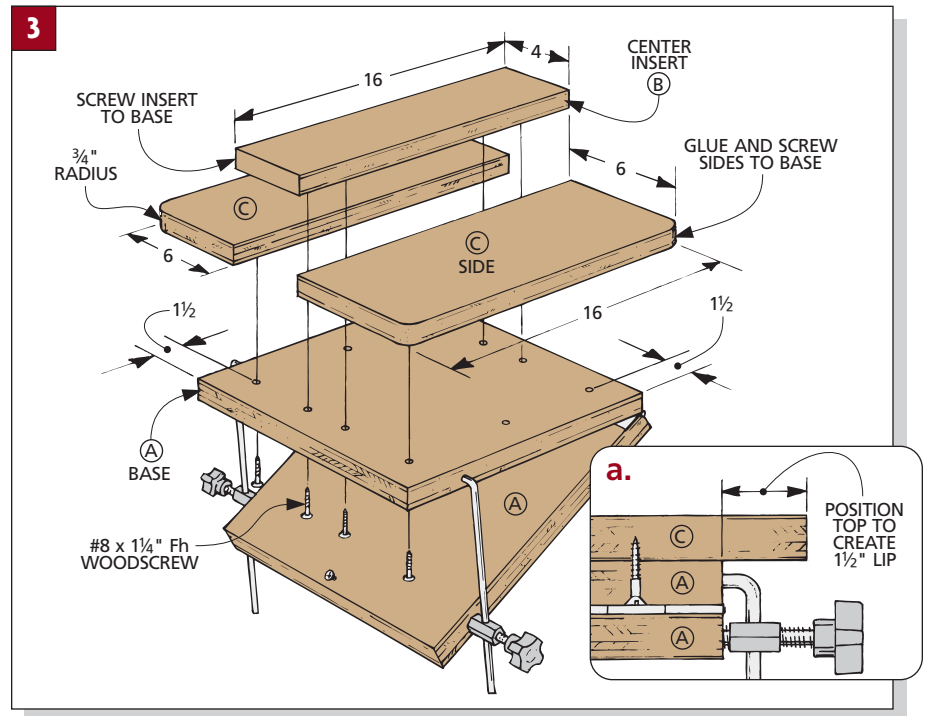
The coupling nut is threaded loosely on a “stud” that’s epoxied into the bottom of the base (Fig. 1b). To create the stud, I cut a 2" section off a carriage bolt and pushed it in place leaving a $\frac{5}{16}$ " stud.

As the table is tilted, the nut turns on the stud. Then by tightening a threaded knob (or thumbscrew) into the coupling nut, it pinches the rod and locks the table in place (Fig. 1b).

TOP. With the support system in place, the next step is to add the top. It has a center insert (B) that can be replaced when it gets “chewed up” (Fig. 3).

The size of the top pieces is determined by the size of the base. Overall, the top is 3" larger than the base (16" square in my case). This creates a $1\frac{1}{2}$ " lip for the fence (built later) to grab onto (Fig. 3a).

To end up with a top this size, I cut the center insert (B) 4" wide by 16" long and



two side pieces (C) 6" wide by 16" long (Fig. 3). Then the insert is screwed to the base. (Don’t glue it, so it can be removed when it gets chewed up.) Next, round over the outside corners of the side pieces, and glue and screw them in place.

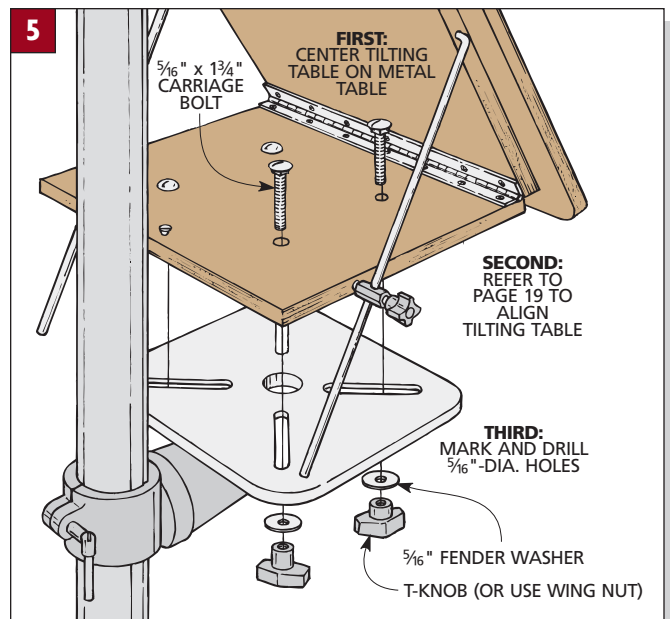
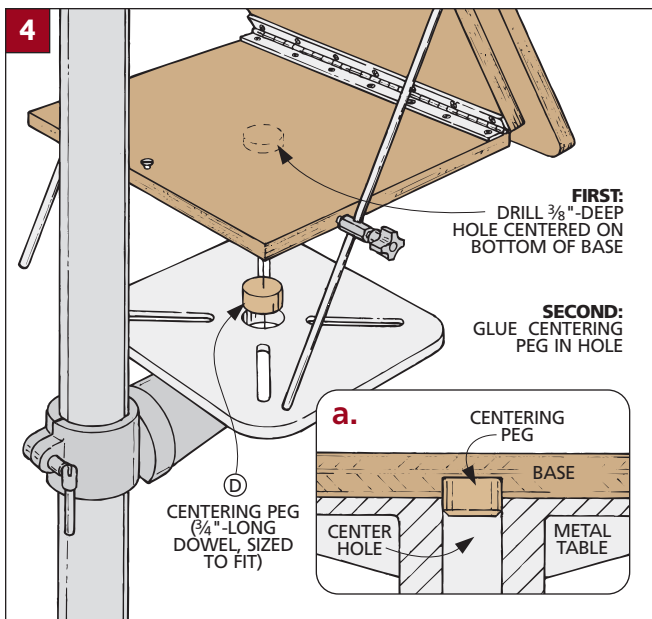
CENTERING PEG. With the top complete, the next step is to align the Tilting Table on the metal drill press table. To do this, I added a centering peg (Fig. 4).

The peg is just a dowel the same diameter as the hole in the metal table. It’s glued into a shallow hole centered on the bottom of the base.

By fitting the peg into the hole on the metal table, the Tilting Table is automatically centered. This makes it much easier to reposition the table if it’s been removed from the drill press.

LOCATE HOLES. The next step is to locate the holes to attach the Tilting Table. But before you can do this, you’ll need to align the table. (Refer to the Setup article on page 19.)

Once the table is aligned, just mark and drill the holes. Then attach the table with carriage bolts and T-knobs (or a couple of wing nuts) (Fig. 5).



FENCE

To complete the Tilting Table, I added a fence with a built-in clamping system. The fence is a simple, but very versatile, assembly. When the table is tilted, the fence can be positioned on the “down-hill” side of a workpiece to keep it in place. Because the table is square, the fence can be positioned from side to side or from front to back. (See the photos on the next page.) And the fence slides off easily when you need to use the full surface of the table.

L-SHAPE. The fence (E) is very simple. It's just two strips of $\frac{3}{4}$ "-thick plywood that are glued and screwed together to form an L-shape (Fig. 6). The width of each strip is $2\frac{1}{2}$ ", but the length is determined by the size of the top.

To figure out this length, add $5\frac{1}{8}$ " to the width (or length) of your top. This allows space for the clamping system that's added next. (In my case, these pieces are $21\frac{1}{8}$ " long.)

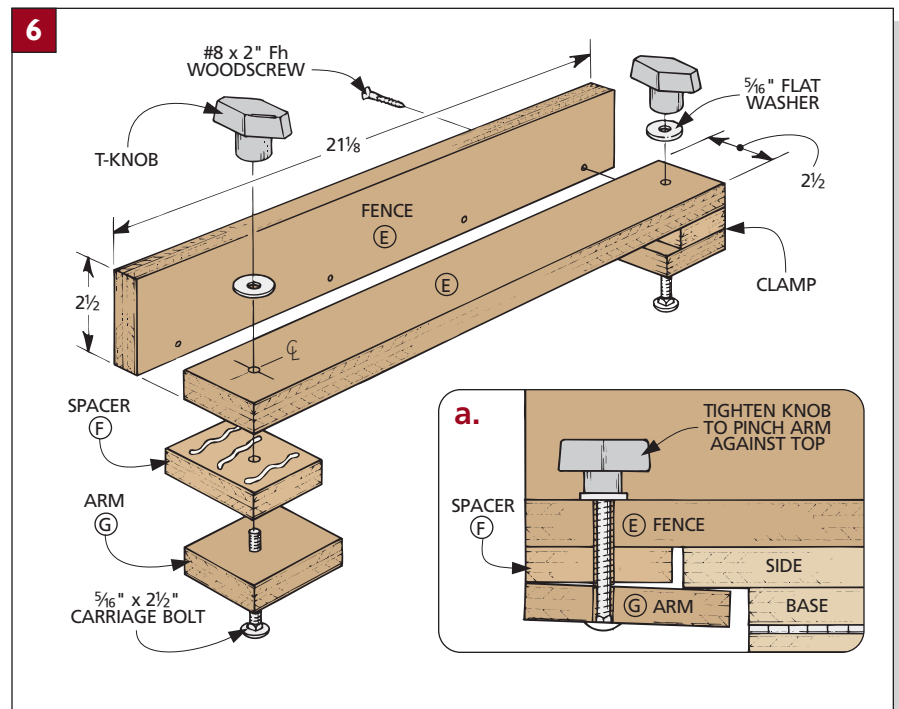
CLAMPING SYSTEM

After gluing and screwing the two fence pieces together, the last thing to work on is the clamping system.

The system consists of a clamp at each end of the fence (Fig. 6). Each clamp is made up of two plywood blocks: a spacer (F) and an arm (G) (Fig. 6a).

What makes the clamp work is that the spacer is slightly thinner than the side (C). So when you tighten the clamp, the arm pinches firmly against the bottom of the tabletop (Fig. 6a).

To provide the clamping pressure, a carriage bolt passes through the arm and



spacer, and up through the fence. By tightening a T-knob (or wing nut) on the bolt, the arm tightens against the top and locks the fence in place.

CUT BLOCKS. The blocks for the spacers and arms are cut from a single 16"-long plywood blank (Fig. 7).

The reason I cut them from a single blank is that before cutting the pieces to length, I trimmed $\frac{1}{16}$ " off its thickness. This way, the pieces ended up thinner than the tabletop (Figs. 7 and 7a).

Note: Plywood may chip excessively if it's fed through a thickness planer, so it's best to do this on the table saw.

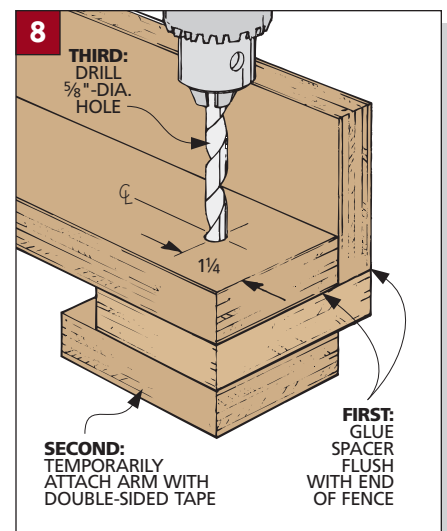
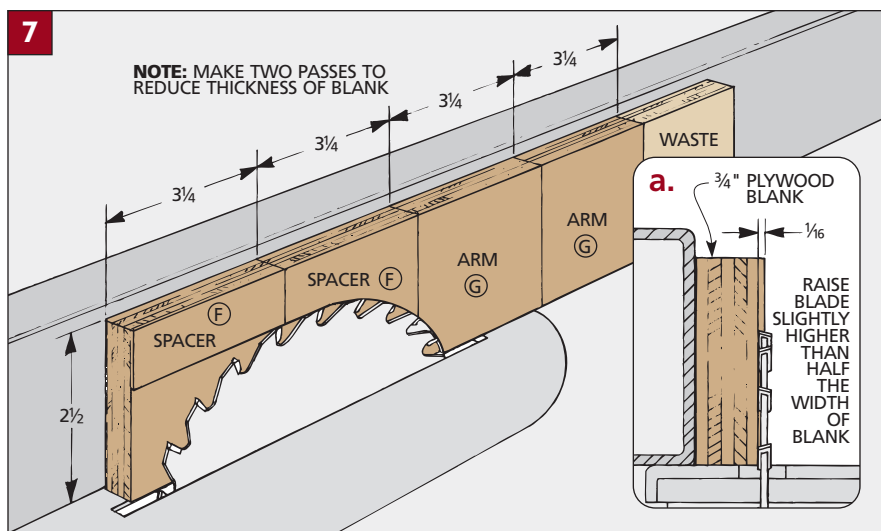
GLUE SPACERS. Now you're ready to cut the pieces to size. Once that's done,

glue the spacers (F) flush with the ends of the fence (Fig. 8).

DRILL HOLES. When the glue dries, holes can be drilled for the carriage bolts. The important thing is to keep the pieces aligned while drilling the holes.

To do this, temporarily attach the arms to the spacers with carpet tape (Fig. 8). (Note that even though the arms and spacers are the same size, they are oriented differently.) Once the pieces are stuck together, drill the holes. Then remove the tape, install the bolts and washers, and thread on the knobs.

FINISH. Finally, to protect the surface of the fence and table, wipe on a couple of coats of tung oil.



SETUP

Tilting Table

Attaching the Tilting Table to the drill press only takes a couple of minutes. But before you secure it in position, you need to align the table.

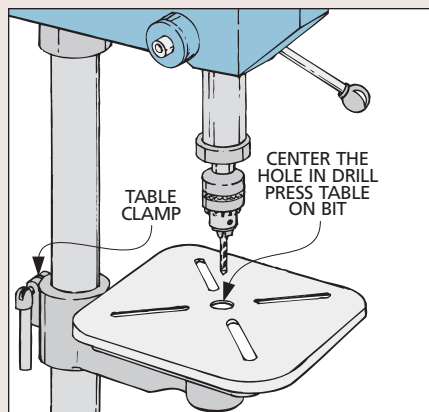
And before doing that, you need to align the metal drill press table with the bit (Step 1). What you want is to have the bit centered over the hole in the metal table. To make this easier, chuck the biggest bit you have into the drill press and lower the quill to the table.

Once that's done, lock the table in place and loosely mount the Tilting Table on the drill press (Step 2). Next, move the Tilting Table around until the insert is centered on the column (Step 3).

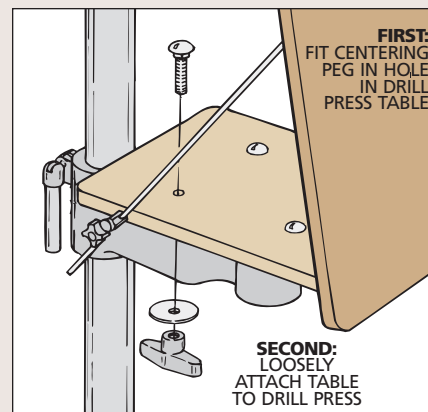
After the table is aligned, a corresponding centerline is drawn down the middle of the insert (Step 4). This makes it easy to reposition after raising or lowering the height of the table.

Now all that's required is to set the table to the desired angle and square up the fence to the edge of the top (Step 5).

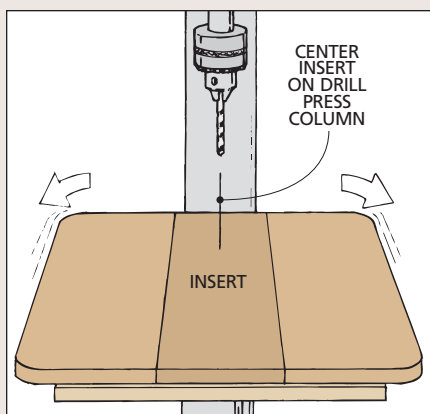
It's important that the fence be square to the table. Otherwise, you end up drilling a hole at a compound angle.



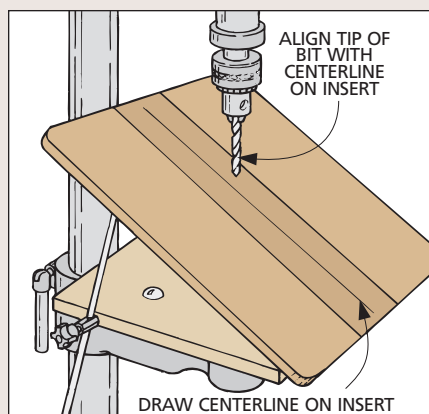
1 After loosening the table clamp, center the hole in the table on a bit chucked in the drill press. Then retighten the clamp.



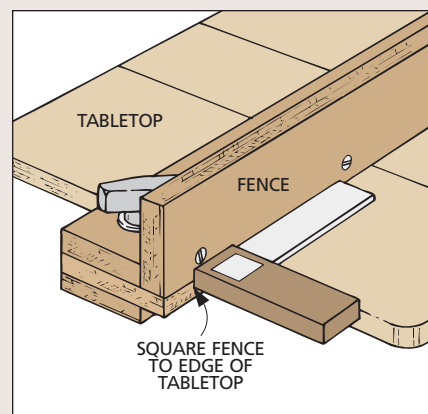
2 Next, set the Tilting Table on the drill press table and attach it loosely with carriage bolts, washers and T-knobs.



3 Now gently twist the Tilting Table until the insert is centered on the column of the drill press. Then tighten the knobs.



4 After adjusting the height of the metal drill press table, simply line the bit up with a centerline drawn on the insert.



5 To avoid drilling compound angle holes, square the fence to the edge of the table before tightening the clamps.

USING THE TABLE



Locking Fence. The fence locks securely to the table. Positioning the fence below a workpiece helps hold the piece in place when drilling angled holes.

Trying to drill into a workpiece held at an angle would require three hands if you didn't have the fence for the jig.

The table is square for a good reason. It allows you to clamp the fence in place so it runs from front to back or from side to side, depending on the job.

As shown in the photo at left, if the hole angles into the width or thickness of a workpiece, you'll be able to position the fence on the "downhill" side.

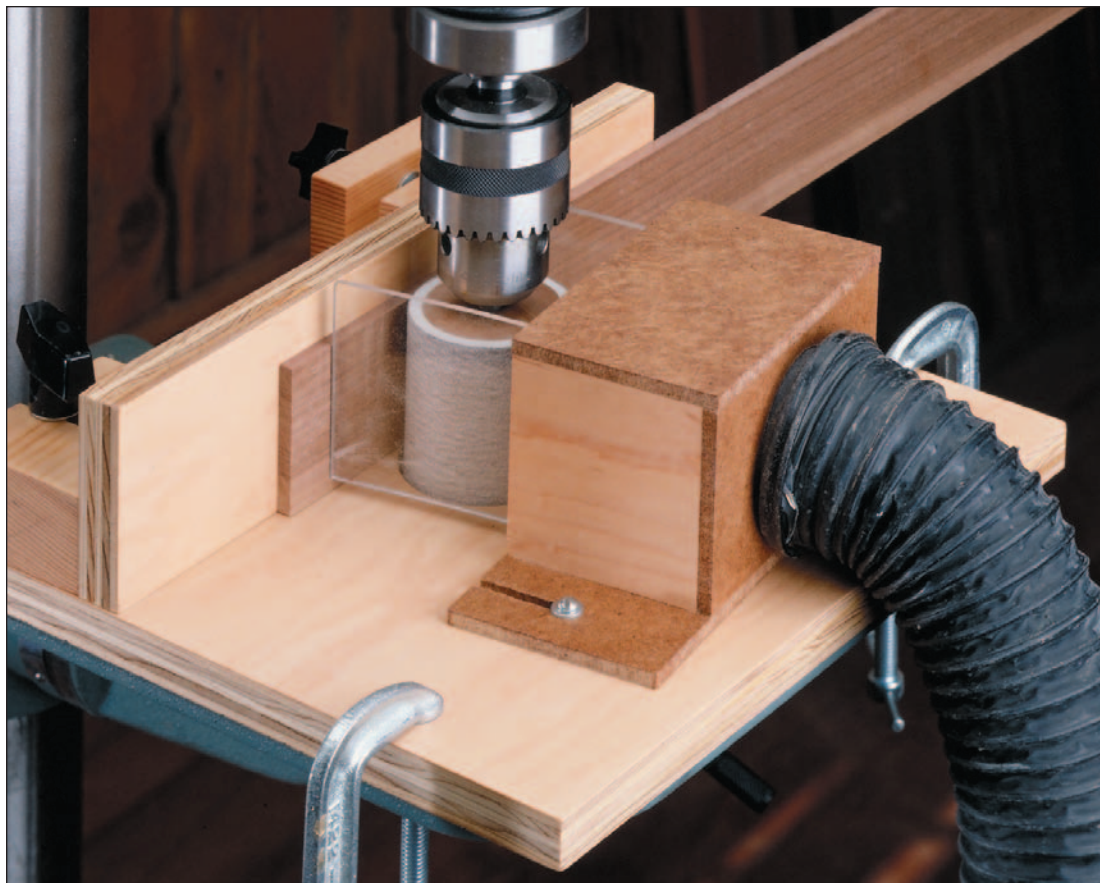
If the hole angles along the length of the workpiece, the fence can run up the table, and the workpiece can be clamped to it (right photo).



Up and Down. When drilling into the length of a workpiece, the table and fence can both be turned 90°. You'll need to clamp the workpiece to the fence.

Thickness Sanding Jig

This jig turns your drill press into a thickness sander, complete with dust collection. It's perfect for bringing thin stock to final thickness. A shop-made sanding drum provides a true, flat surface.



One way to make thin stock is to resaw a board and then sand away the saw marks. The trick is to remove the marks and leave the stock uniform in thickness.

Hand sanding will remove the marks, but it's a lot of work, and you're not likely to get a uniform thickness.

So how about using a thickness planer? With thin stock, that can make me a little nervous. Chipout can ruin a thin piece. And pieces less than 1/4" thick shouldn't be run through a planer unless they're attached to a carrier board.

To solve this problem, I built this Thickness Sanding Jig. It clamps to the

drill press table and uses a drum sander to smooth the workpiece.

It works kind of like a thickness planer turned on its side. The workpiece is fed between a fence and the sanding drum. The fence acts as the infeed and outfeed tables. And the drum does the work of the planer knives. But the sanding drum removes the stock more gently than a planer. So there won't be any chipout.

MICRO-ADJUSTABLE. The fence has a built-in micro-adjustment feature. This allows precise movement of the fence to bring your stock to the right thickness.

DUST COLLECTION. Sanding creates a lot of dust. So the jig includes a dust box

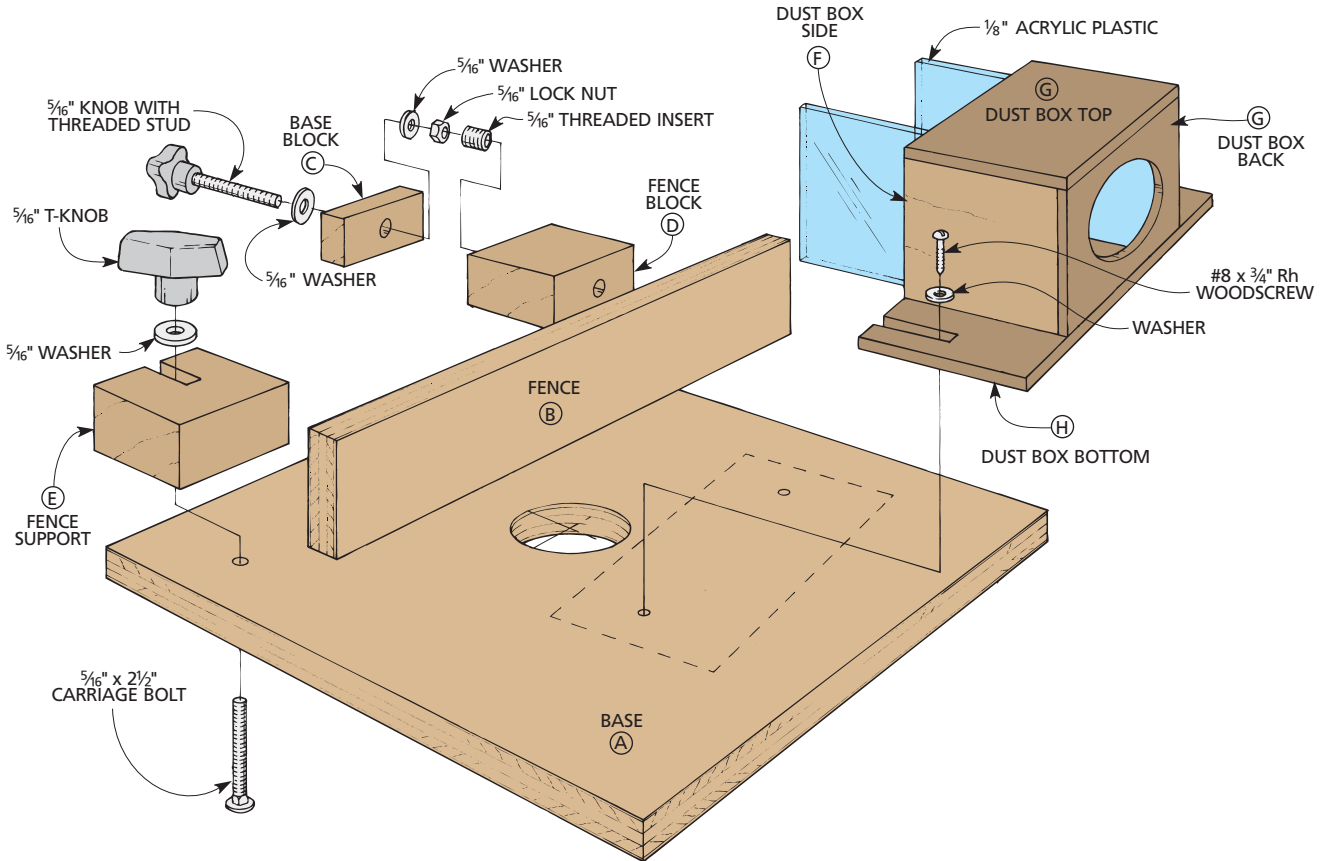
that connects to a shop vacuum. But the dust box does more than just keep things tidy. Two pieces of acrylic plastic attached to the box also serve as featherboards to keep workpieces pressed against the fence. And they keep your fingers away from the spinning sanding drum.

SHOP-MADE DRUM. I even built my own sanding drum to use with the jig. It's a piece of PVC pipe wrapped with self-adhesive sandpaper. (Details about this are in the Woodworker's Notebook on page 25.) The reason for building a drum is that regular sanding drums can bulge outward in the middle. That means you wouldn't get a flat face on the board.

EXPLODED VIEW

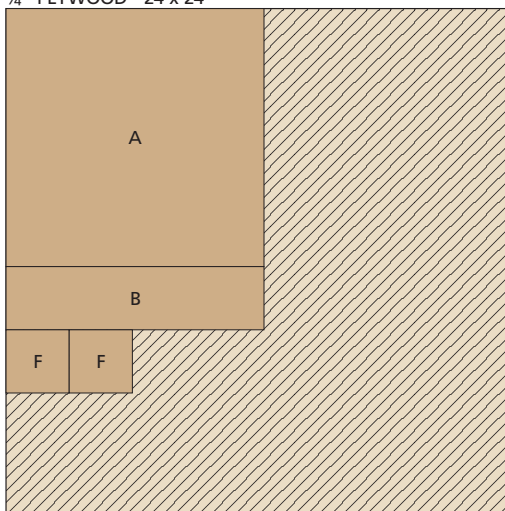
OVERALL DIMENSIONS:

12 1/4" W x 12 1/4" D x 4 1/4" H

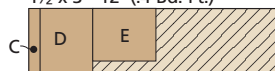


CUTTING DIAGRAM

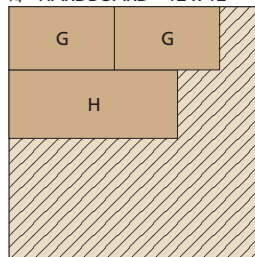
3/4" PLYWOOD - 24 x 24



1 1/2 x 3 - 12 (.4 Bd. Ft.)



1/4" HARDBOARD - 12 x 12



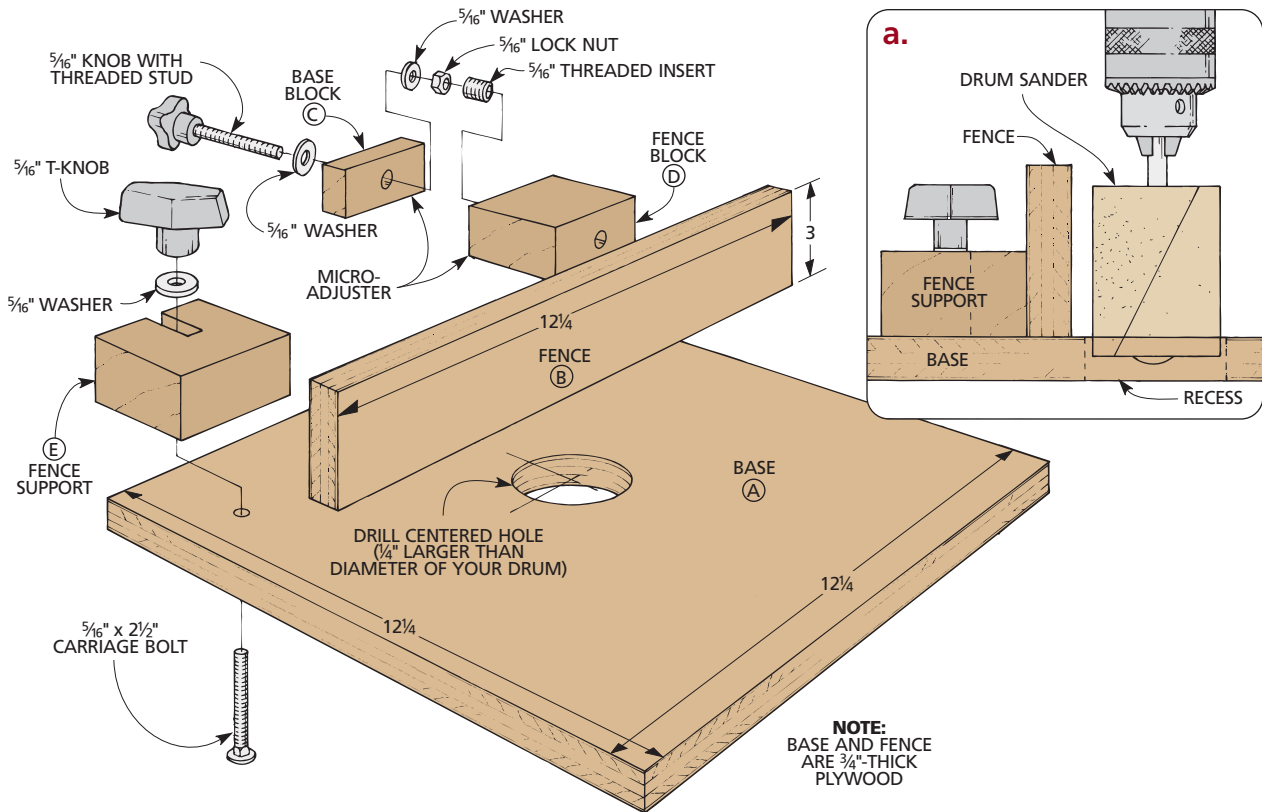
MATERIALS LIST

WOOD

A Base (1)	3/4 ply - 12 1/4 x 12 1/4
B Fence (1)	3/4 ply - 3 x 12 1/4
C Base Block (1)	1 1/2 x 3 - 3/4
D Fence Block (1)	1 1/2 x 3 - 2 5/8
E Fence Support (1)	1 1/2 x 2 1/2 - 3
F Dust Box Sides (2)	3/4 ply - 3 x 3
G Dust Box Bk./Top (2)	1/4 hdbd. - 3 x 5
H Dust Box Btm. (1)	1/4 hdbd. - 3 1/4 x 8

HARDWARE SUPPLIES

- (6) No. 8 x 3/4" Rh woodscrews
- (2) No. 8 x 1 1/4" Fh woodscrews
- (1) 5/16" knob w/ threaded stud
- (5) 5/16" washers
- (1) 5/16" T-knob
- (1) 5/16" lock nut
- (1) 5/16" threaded insert
- (1) 5/16" x 2 1/2" carriage bolt
- (2) 1/8" acrylic plastic, 3" x 6"



BASE

The Thickness Sanding Jig consists of three main parts: a simple plywood base, a fence assembly, and a dust collector. Since all the pieces are fastened to the base, I started with it.

To provide a smooth, flat surface for attaching the fence assembly and dust collector, I cut a square base (A) from 3/4\" plywood (Fig. 1).

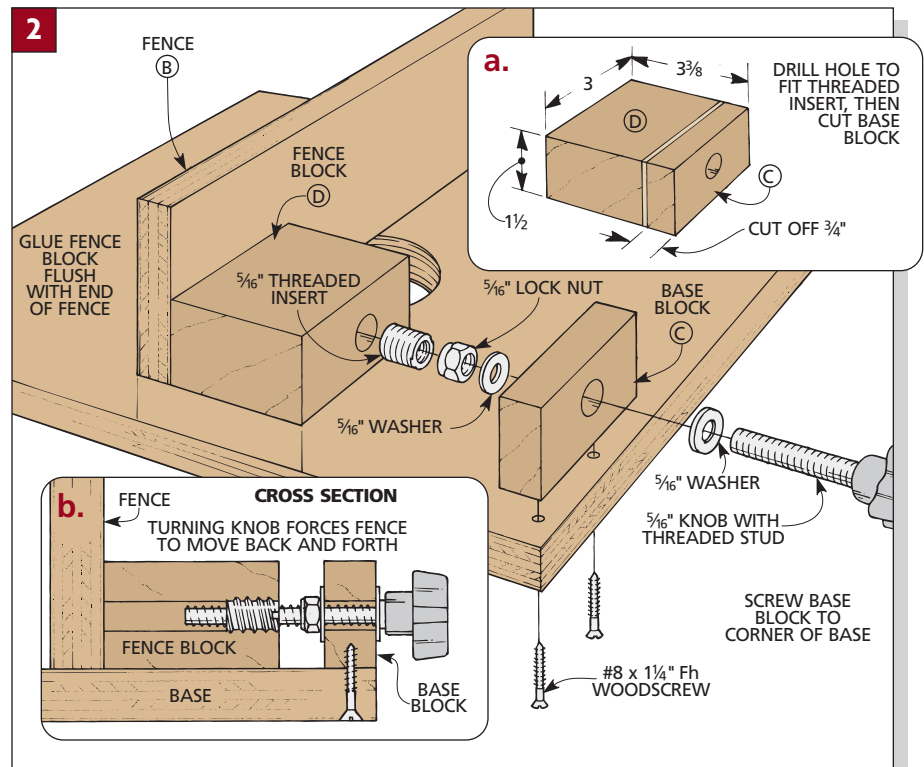
Then all you need to do is drill a hole in the center of the base to form a recess for the drum sander (Fig. 1a). The hole is sized 1/4\" larger than the sanding drum.

SANDING DRUM. Before moving on to the fence, this is a good time to talk about the sanding drum used in the jig. You can buy drums in a variety of diameters and lengths. In my jig, I used a shop-made drum that was 2\" in diameter and 3 1/8\" long. (The construction of this drum is covered in the Woodworker's Notebook on page 25.)

One thing to consider is that the length of the drum determines the width of the stock you can thickness. So why not make a 12\"-long drum that would cover almost any need? There are a couple of good reasons. First, as the drum gets longer, it exerts more sideways pressure on the

drill press quill when using the jig. That can be hard on the drill press. And if there is any runout (side-to-side play) in the quill, it will be exaggerated at the

bottom of a long drum. The result would be a workpiece that was tapered from the proper thickness at the top edge to over-thick at the bottom.



FENCE ASSEMBLY

Once the base is complete, the next step is to make the fence assembly (*Fig. 1*). The fence is adjustable at each end. By adjusting the space between the fence and the drum you can sand stock up to $\frac{1}{2}$ " thick. The fence assembly is made up of three pieces: a plywood fence, a micro-adjuster, and a fence support (*Fig. 1*).

FENCE. To make the fence assembly, start by cutting a 3"-tall fence (B) from $\frac{3}{4}$ " plywood to match the width of the base (A) (*Fig. 1*). That's all there is to the fence. Now you can add the pieces that make it adjustable.

MICRO-ADJUSTER. To "fine-tune" the space between the fence and the drum, I added a micro-adjuster behind the fence.

The micro-adjuster is made up of two small blocks — a base block (C) and a fence block (D) (*Fig. 2*). A threaded stud passes through the base block and is held in place with a lock nut.

The stud screws into a threaded insert in the fence block (D) (*Fig. 2b*). When you turn the knob, the insert moves along the stud. In turn, this moves the end of the fence back and forth.

Both pieces of the micro-adjuster are cut from a single blank (*Fig. 2a*). For the threaded stud to line up perfectly in both blocks, drill a hole through the blank first, then cut the base block (C) off the fence block (D) (*Fig. 2a*).

Next, screw the base block to the base. Then slide the threaded stud through the hole and thread on the lock nut. Now, install the threaded insert into the fence block (D) (see the Shop Tip at right).

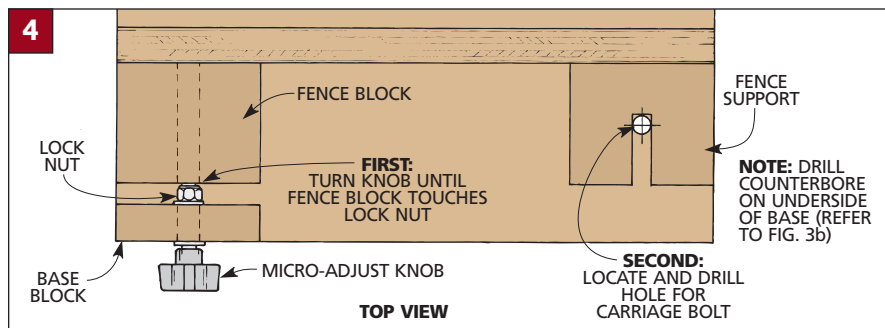
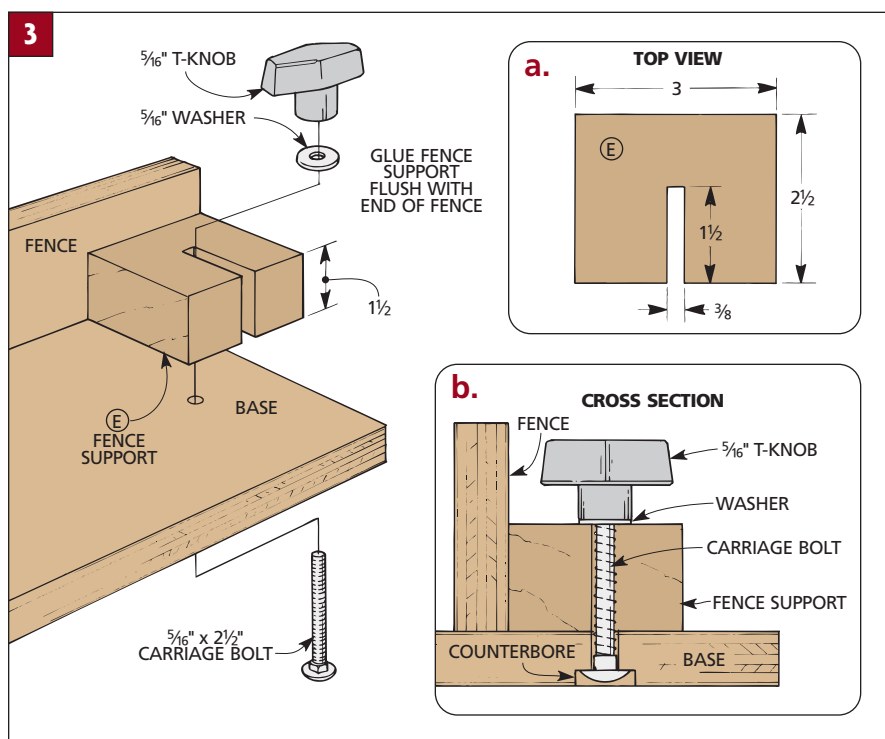
And finally, glue this block to the fence, flush with the bottom edge (*Fig. 2*).

FENCE SUPPORT. To support the other end of the fence, I added a fence support (E) (*Fig. 3*). It's just a piece of $1\frac{1}{2}$ "-thick stock with a notch cut in it (*Fig. 3a*). The notch allows the end of the fence to slide in and out for rough positioning.

A carriage bolt and a T-knob hold this end of the fence in place. To locate the hole for this bolt, turn the micro-adjust knob until the fence block (D) pulls up tight against the lock nut (*Fig. 4*).

Now use the fence support block to help you locate and drill a counterbored hole in the base for the bolt (*Fig. 4*). Finally, push a $2\frac{1}{2}$ "-long carriage bolt through the base and thread on a washer and a T-knob (*Fig. 3b*).

Now you can move on to making the dust collection box.



SHOP TIP

..... Installing Inserts

Driving threaded inserts is easy — once you get it started. The trick is keeping the insert straight and applying pressure.

Typically, I've used a cut-off bolt in the drill press to help drive the inserts. But I discovered a new tool that makes this process easier (top photo). It's a driver that chucks into my drill. (It also works in the drill press, if you turn the chuck by hand.) Two flanges

on the driver fit into the slots in the top of the insert, like a screwdriver in the head of a screw (bottom photo).

With the drill running slowly, I can start the insert into the wood. Once it's started it can be quickly driven flush with or just below the surface of the wood.

One advantage to using this driver is that it makes it easy to install inserts in the middle of wide panels.



DUST BOX

With the fence assembly attached to the base, you can add the dust box.

The box has an open end that faces the drum. A hole in the back is sized to fit your shop vacuum hose (*Fig. 6*).

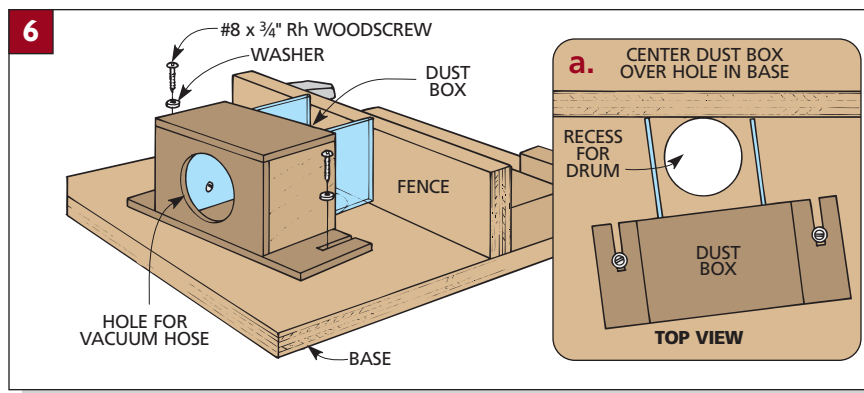
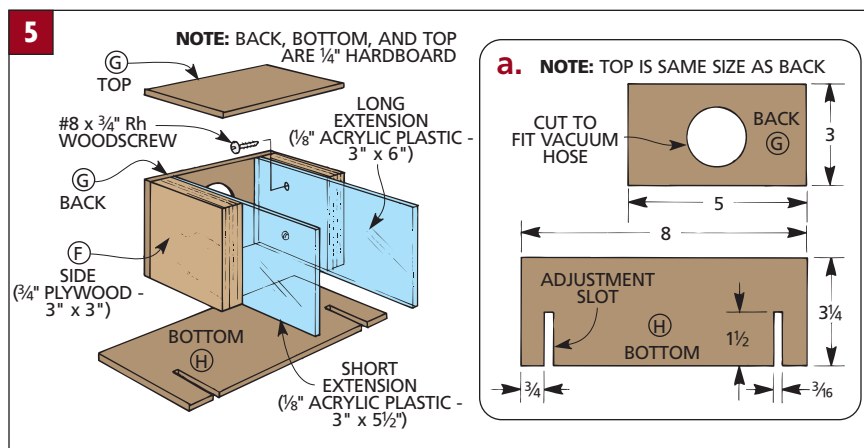
The box sides (F) are cut from $\frac{3}{4}$ " plywood. The box top (G), back (G), and bottom (H) are $\frac{1}{4}$ " hardboard (*Fig. 5*). The bottom extends beyond the sides so slots can be cut in the bottom to allow the collector to be positioned or removed.

Before gluing these pieces together, there are a couple more items to add.

EXTENSIONS. To help concentrate the vacuum suction, and allow a clear view of the workpiece, I added a pair of acrylic plastic extensions to the dust box (*Fig. 5*). The extensions also act as guards around the rotating drum.

FEATHERBOARDS. Also, by making one extension longer than the other and mounting the collector at an angle, the extensions work like featherboards. This way they press the workpiece tight against the fence (*Fig. 6a*).

After screwing the extensions in place, glue the dust box together.



SETUP

Thickness Sanding Jig

Setting up the jig doesn't take long. The first step is mounting a sanding drum in the drill press (refer to the Woodworker's Notebook on page 25).

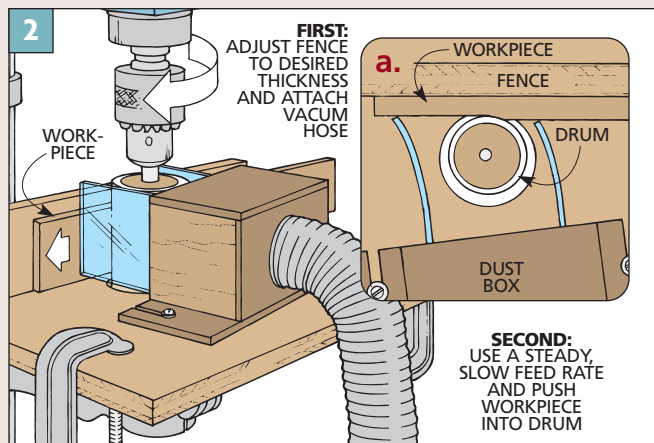
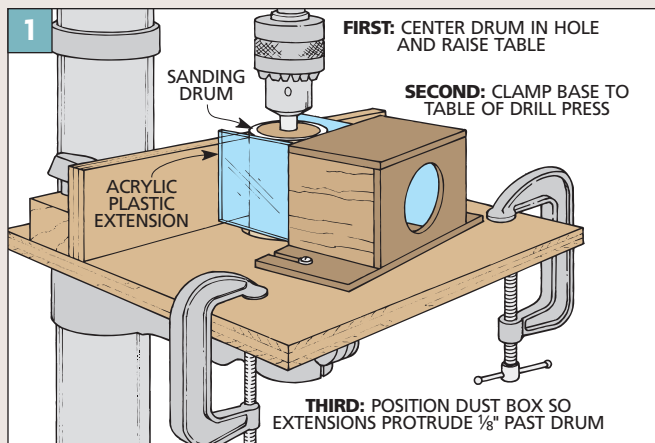
Next, place the jig on the drill press table with the drum centered in the hole in the jig. Now raise the drill press table slightly to bury about $\frac{1}{8}$ " of the drum in the base (refer to *Fig. 1a* on page 22). Then clamp the jig in place (*Fig. 1* below).

With the jig in place, position the dust collector on the base so the extensions protrude about $\frac{1}{8}$ " past the drum sander.

ADJUST THICKNESS. The next step is positioning the fence to sand to the desired thickness. First, place a piece of the stock you'll be sanding between the fence and the drum. Then remove the stock and use the micro-adjuster to move the fence toward the drum slightly.

After attaching the vacuum hose, you're ready to go. Turn the drill press on and feed a workpiece slowly into the drum (*Fig. 2*). For the best results, use a steady, even feed rate.

LIGHT PASSES. As you run pieces through the jig, don't try to take off too much stock in one pass. If it sounds like the drill press is starting to "bog down," readjust the fence to remove less stock.



WOODWORKER'S NOTEBOOK

One of the keys to getting good results with the Thickness Sanding Jig is having a sanding drum that provides a solid, flat surface. A piece of PVC pipe provides the foundation for this shop-made drum.

DRUM SANDER

■ Most drum sanders have a body made out of flexible rubber. When a sanding sleeve is slipped over the rubber body and the drum is tightened, the center of

the drum bows out. If you use this type of sanding drum on the Thickness Sanding Jig, the bow “dishes out” the workpiece.

To solve this problem, I use a shop-made drum sander. It's a piece of PVC pipe with a strip of self-adhesive sandpaper wrapped around (see photo).

■ The shaft of my drum sander is a 6"-long, $\frac{3}{8}$ " carriage bolt with the threads cut off (Figs. 1 and 1a).

■ For a core, I used five 2"-dia. flat toy wheels. These wheels fit perfectly inside 2" PVC and have a center hole that fits the shaft (Fig. 1). Cut the PVC to length to match the combined height of the wheels (Fig. 1).

■ To assemble the drum, use a dab of epoxy between

each wheel. Also epoxy the shaft in the core and the core in the pipe (Fig. 1).

■ Now true up the drum by gluing a strip of sandpaper to a piece of $\frac{1}{4}$ " hardboard. Then adjust the fence on the jig to $\frac{1}{4}$ " and feed the hardboard (sandpaper facing out) into the rotating drum (Fig. 2). Repeat as needed, adjusting the fence between passes until the drum is round.

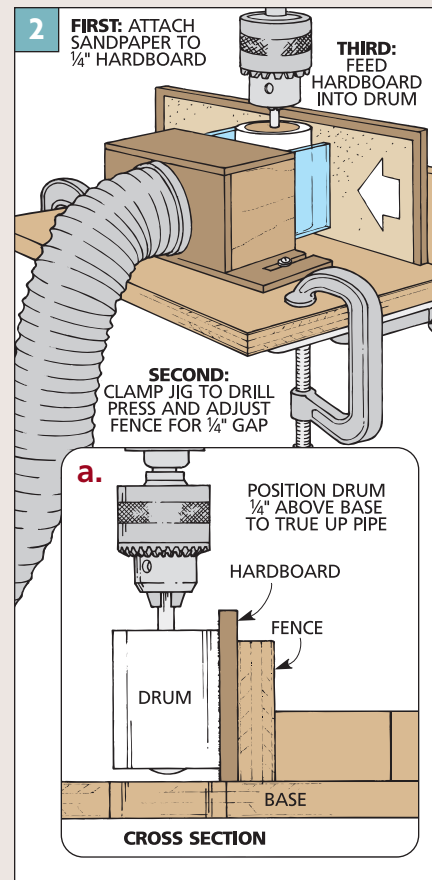
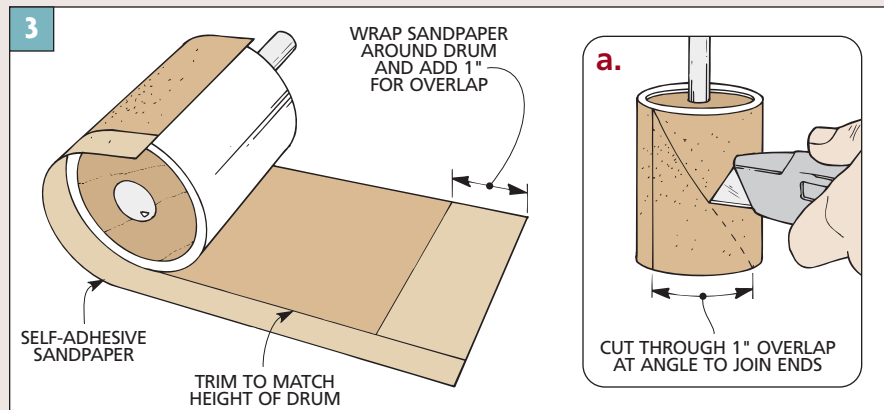
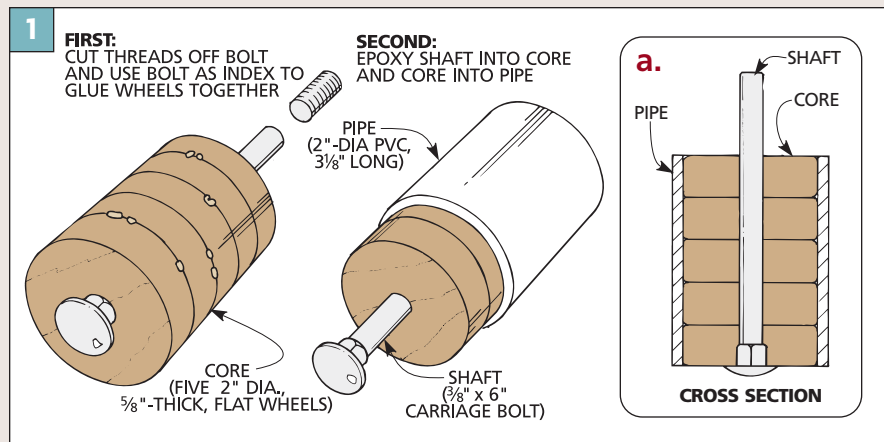
■ The sandpaper is cut to length so it overlaps itself about 1" (Figs. 3 and 3a). Make an angled cut through the overlap so the entire seam doesn't pass over the workpiece at once.



MATERIALS LIST

HARDWARE SUPPLIES

- (5) Wood wheels, 2" dia., $\frac{5}{8}$ " thick
- (1) 2"-dia. PVC, $3\frac{1}{8}$ " long
- (1) $\frac{3}{8}$ " x 6" carriage bolt
- (1) Self-adhesive sandpaper, 4" x 8" rough



Sharpening Wheel

Round and round, and up and down, this simple jig turns your drill press into a sharpening system that gives you a hollow-ground bevel. Then you can hone the edge on the leather-covered surface.



Have you ever tried to sharpen a chisel on a grinder and watched as the blade flashed from silver to yellow to blue in just a matter of seconds? That happens because the friction from a fast-spinning grinding wheel causes the blade to heat up and lose its temper. Once it does, the tool loses its ability to hold an edge and is ruined.

SLOW DOWN. So what's the solution? A slow-speed grinder is one answer. Because the grinding wheel spins slower, there's less chance of ruining a tool by overheating it. But slow-speed grinders aren't cheap. So I decided to come up with my own version. Instead of a slow-

speed motor, however, the sharpening jig shown here uses a tool you probably already have in your shop — a drill press.

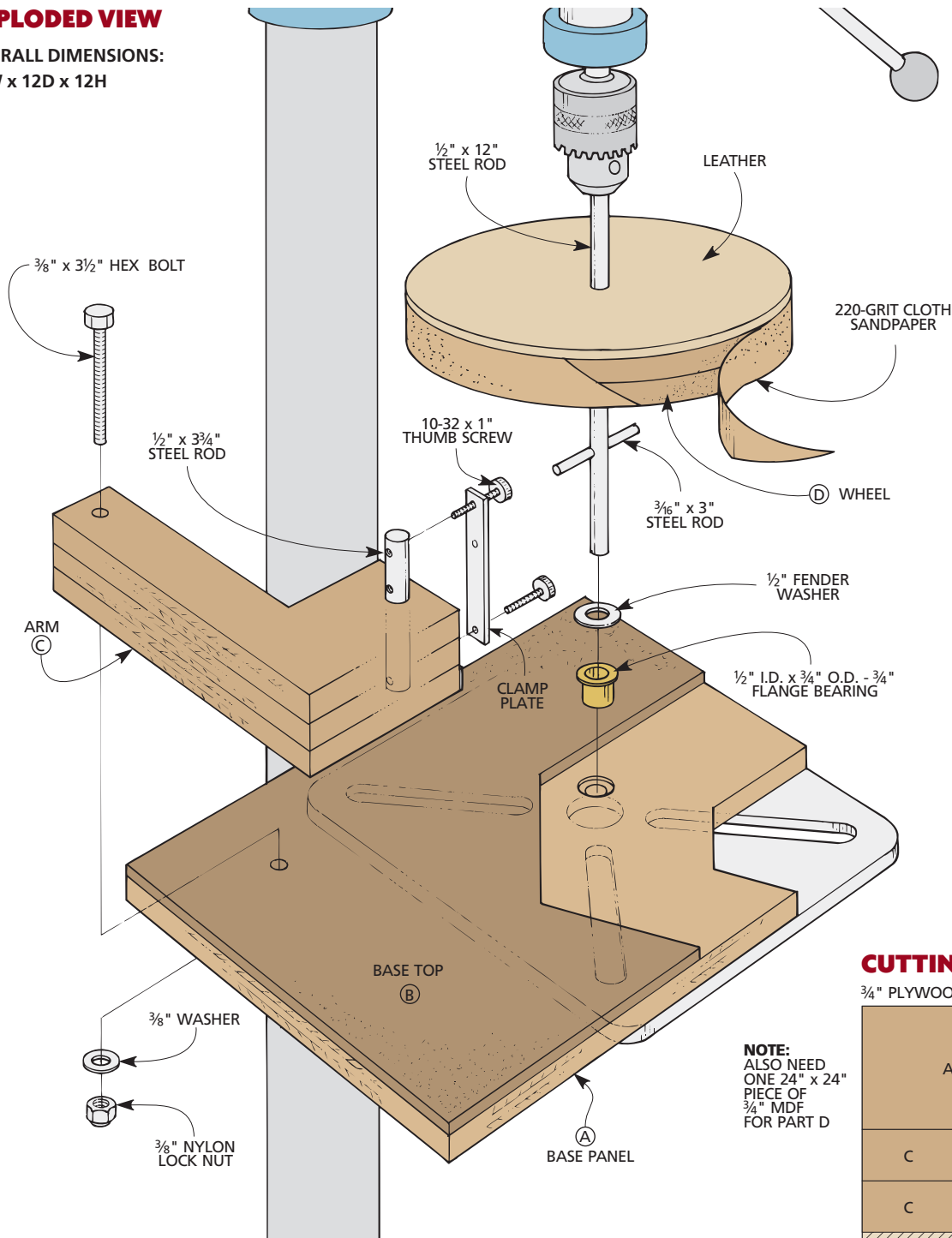
MDF AND SANDPAPER. The grinding “wheel” on this jig is really a large disc made out of two layers of medium-density fiberboard (MDF). Cloth-backed sandpaper is glued to the rim and the wheel is chucked up in the drill press. By setting the drill press to its lowest speed, you have a slow-speed grinder that sharpens your tools quickly with much less risk of burning them. And a pivoting arm holds both chisels and plane irons at the proper angle so you end up with a perfect, hollow-ground bevel. This leaves your

hands free to guide the tool into the wheel and to work the wheel up and down.

HONING. This jig not only sharpens your tools, it also has a built-in honing feature, as shown in the inset photo above. A piece of leather is mounted to the top of the wheel and is charged with rouge or honing compound. The stropping action of the leather polishes the edge of the bevel to a mirror shine. You can see this more clearly in the photos on page 32.

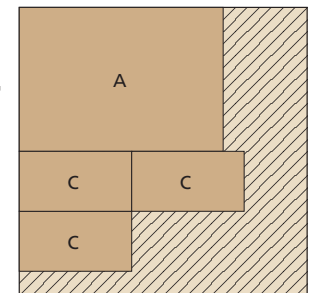
EXPLODED VIEW

OVERALL DIMENSIONS:
17W x 12D x 12H



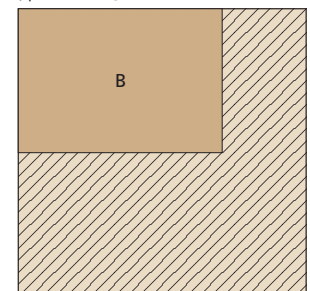
CUTTING DIAGRAM

3/4" PLYWOOD - 24 x 24



NOTE:
ALSO NEED
ONE 24" x 24"
PIECE OF
3/4" MDF
FOR PART D

1/4" HARDBOARD - 24 x 24



MATERIALS LIST

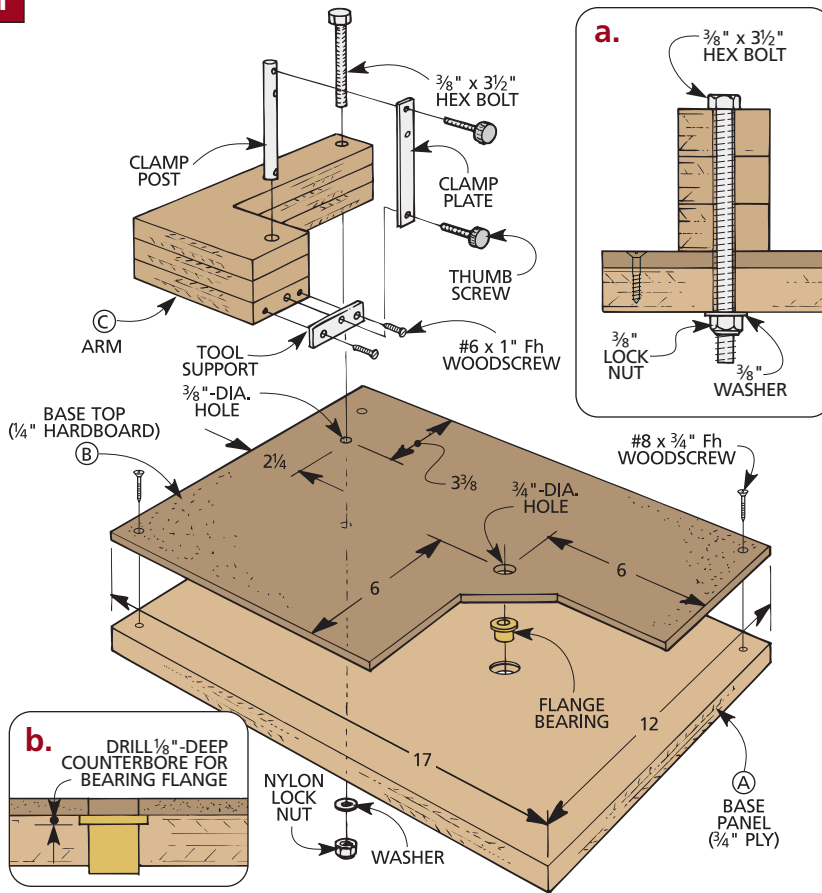
WOOD

- A** Base Panel (1) 3/4 ply - 12 x 17
- B** Base Top (1) 1/4 hdbd. - 12 x 17
- C** Arm (1) 2 1/4 ply - 5 x 9 3/8
- D** Wheel (1) 1 1/2 MDF - 10 dia.

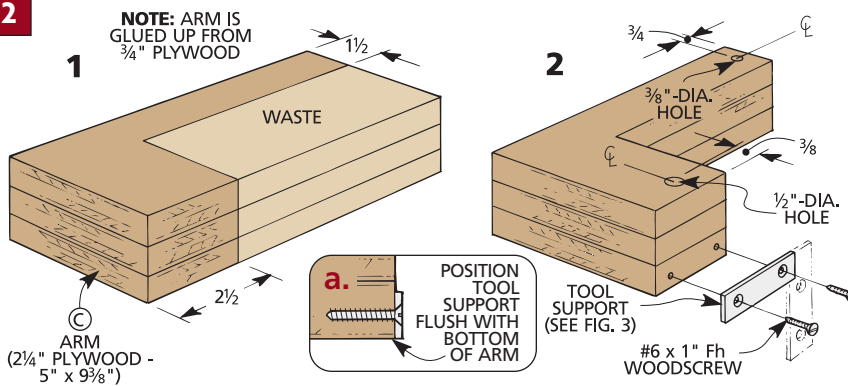
HARDWARE SUPPLIES

- (2) No. 6 x 1" Fh woodscrews
- (4) No. 8 x 3/4" Fh woodscrews
- (2) No. 10-32 x 1" thumb screws
- (1) 1/2" x 18" steel rod
- (1) 3/16" x 3" steel rod
- (1) 1/2" I.D. x 3/4" O.D. - 3/4" flange bearing
- (1) 1/2" fender washer
- (1) 5/8" x 3" L-bracket (mending plate)
- (1) 1/8" x 1/2" steel plate, 3 3/4" long
- (1) 3/8" x 3 1/2" hex bolt
- (1) 3/8" nylon lock nut
- (1) 3/8" flat washer
- (1 roll) 1 1/2"-wide cloth sandpaper
- (1 pc.) Leather, 11" rough x 11" rough

1



2



3

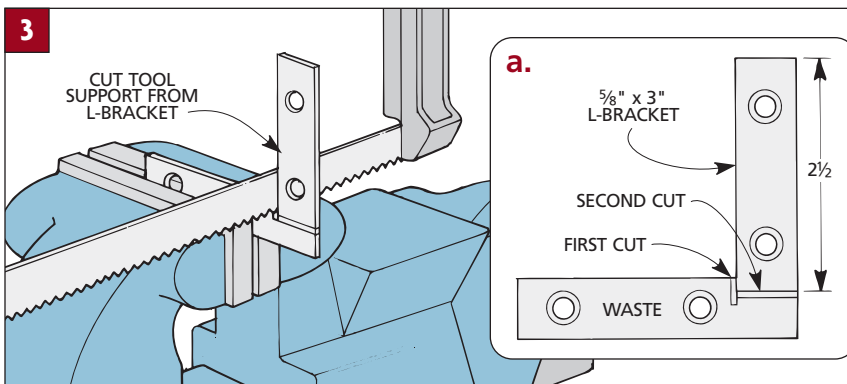


TABLE & ARM

This drill press sharpening jig consists of three main assemblies — a wheel that is chucked up in the drill press, a pivoting arm that holds the tool to be sharpened, and a base that supports everything. Because the base will be used to assemble and true up the sharpening wheel, I made it first.

BASE. The base is nothing more than a piece of $\frac{3}{4}$ " plywood covered with a piece of $\frac{1}{4}$ "-thick hardboard (Fig. 1). Sandwiched in between these two pieces is a bronze flange bearing. The shaft of the Sharpening Wheel will ride in this bearing once the jig is complete. But I'm getting ahead of myself.

To make the base, start by cutting a base panel (A) from $\frac{3}{4}$ " plywood and a base top (B) from $\frac{1}{4}$ " hardboard. These pieces are identically sized (Fig. 1).

There are two holes in the base. One is for the flange bearing and the other is for a hex bolt that will serve as the pivot point for the arm of the jig. To make sure these holes lined up perfectly, I taped the two layers of the base together before laying out and drilling the holes. (I just used a few strips of masking tape to hold the two panels together temporarily.)

Once the holes are drilled, use a Forstner bit to drill a shallow ($\frac{1}{8}$ "-deep) counterbore in the top of the plywood panel (Fig. 1b). This is for the flange of the wheel shaft bearing. Once this is done, the hardboard and plywood panels can be screwed together, with the bearing trapped in between them. But I didn't glue these two pieces together. This way you can get at the flange bearing in case it ever needs to be replaced.

ARM. With the base complete, you can begin making the arm of the jig. The main purpose of the arm is to serve as a tool rest. Chisels or plane irons can be clamped to the arm and then held against the rotating Sharpening Wheel. (See the photos on the next page.)

The arm (C) is cut from a blank glued up out of three layers of plywood (Fig. 2). It's cut to an L-shape with a band saw or a jig saw. Then a hole is drilled at each end. The hole at the long end of the "L" is for the hex bolt that attaches the arm to the base. And the other is for a steel rod that will be used to clamp the tool that is being sharpened in place.

To complete the arm, you'll need to do a little metalworking. But don't worry. There's nothing all that involved here.

Mostly just some sawing, drilling, and then tapping threads. (There are even a few tips on tapping at the end of this article. See page 33.)

TOOL SUPPORT. There are three metal parts that you'll have to make for the arm. The first is a tool support. This is just a small, thin piece of steel that is screwed to the end of the arm (*Fig. 2*). The long edge of the chisel or plane iron you want to sharpen will rest on this support. (See the photos below.)

I made the tool support by cutting off one of the legs of an L-bracket (also known as a mending plate). You can find these at hardware stores. The nice thing about using a mending plate for the tool support is that the mounting holes are already drilled. But you'll have to make two separate cuts with a hacksaw to cut this piece out of the L-bracket (*Fig. 3*). The first cut is a shallow one (*Fig. 3a*). Then the second cut separates the support from the L-bracket.

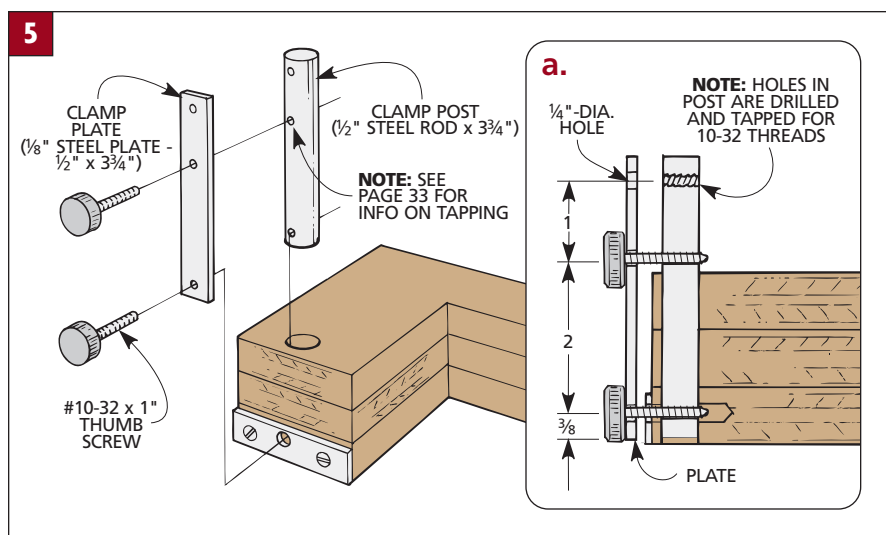
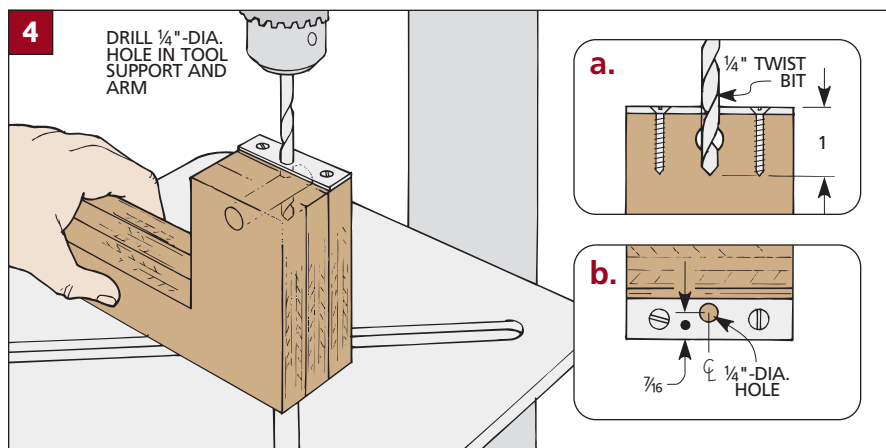
The tool support is screwed to the end of the arm, flush with the bottom. When it's in place, you can drill a hole through the support and into the arm (*Fig. 4*). Keep in mind that you'll need to make this hole deep enough to provide clearance for the thumb screw that is added later (*Fig. 4a*).

CLAMP PLATE. The tool is held in place by a clamp plate. Turning a couple of thumb screws tightens the clamp plate against the tool, holding it firmly in place. The thumb screws are threaded into a steel post that is mounted near the end of the arm. To accommodate different widths of tools, there are two positions for the top thumb screw.

You can cut the clamp plate from a piece of $\frac{1}{8}$ "-thick steel stock (*Fig. 5*). (Steel stock can also be found at most hardware stores.) Then drill three over-size ($\frac{1}{4}$ "-dia.) holes for the thumb screws (*Fig. 5a*). That way, the full width of the heads of the thumb screws will provide the pressure on the plate.

CLAMP POST. The clamp post is cut from a piece of steel rod. It also has three holes drilled in it, but these holes are smaller and are tapped to match the threads on the thumb screws. To mark the positions of the holes, I used the clamp plate as a template and a fine-tip permanent marker to mark the post.

To help support the steel rod while drilling the holes, I used a V-block. (For more on drilling and tapping these holes, please turn to page 33.)



ASSEMBLY. Once you've finished work on all the metal parts, you're ready to start assembling them. First, the arm is attached to the base with a hex bolt, a washer, and a nylon lock nut (*Fig. 1a*). Just make sure that you don't tighten the nut down all the way. The arm should pivot freely, but there shouldn't be any up or down play.

Now, to add the tool clamp, first push the rod into the hole in the arm so the tapped holes face forward (*Fig. 5*). (Note that the post doesn't bottom out in the arm.) You'll have to check and make sure that the bottom hole on the post lines up with the hole you drilled earlier in the tool support (*Fig. 5a*). Then simply add the clamp plate and thumb screws.



The clamping system on the arm is designed to hold either a chisel or a plane iron (see photo at right). The thumb screw fits in the middle hole to clamp chisels.



For plane irons, the top thumb screw fits into the upper hole. The angle of the bevel can be changed by moving the tool forward or back in the arm.

WHEEL

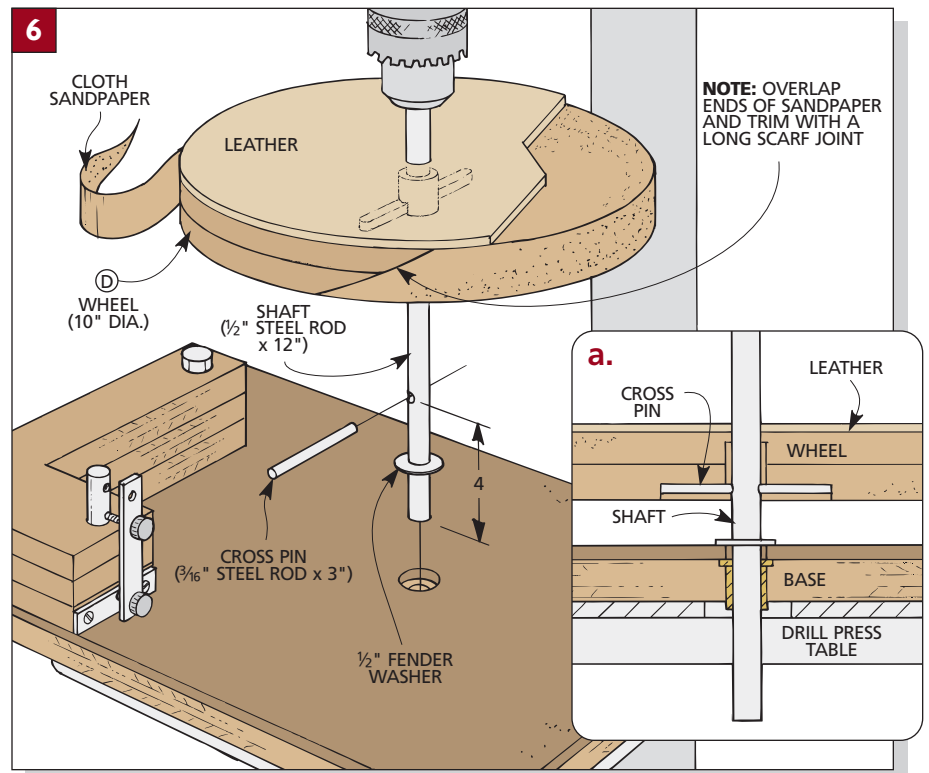
With the base and arm complete, you can concentrate on making the wheel. There's nothing complicated about the wheel — it's simply two layers of MDF that are glued together. After it's cut to shape, a steel rod that serves as the shaft is epoxied in place (*Fig. 6*).

The important thing is that the wheel runs true. Later, I'll share some tips on how to go about this. But for right now, start by cutting a couple of oversized pieces of MDF for the wheel. These can be glued up into a square blank (*Fig. 7*).

LEATHER. The top of the wheel is covered with leather to allow you to hone your tools after you've sharpened them. I used a small piece of vegetable-tanned tooling leather (see page 126 for sources). The leather can be cut with a utility knife and glued to the blank with contact adhesive. Don't worry about cutting the leather to fit the blank exactly — you'll be trimming off the excess when you cut the wheel. Just make sure it goes down without any wrinkles.

LAYOUT. After you've glued the leather down, turn the blank over and mark the center. Using a compass, lay out a 10"-dia. circle around the centerpoint.

Before cutting out the wheel, the hole for the steel rod is drilled in the blank. This is a two-step procedure. First, a deep, $\frac{3}{4}$ "-dia. counterbore is drilled in the blank (*Fig. 7a*). Then a $\frac{1}{2}$ "-dia. hole is drilled the rest of the way through the blank and the leather. The oversized counterbore creates a "well" that will hold the epoxy around the $\frac{1}{2}$ "-dia. rod.

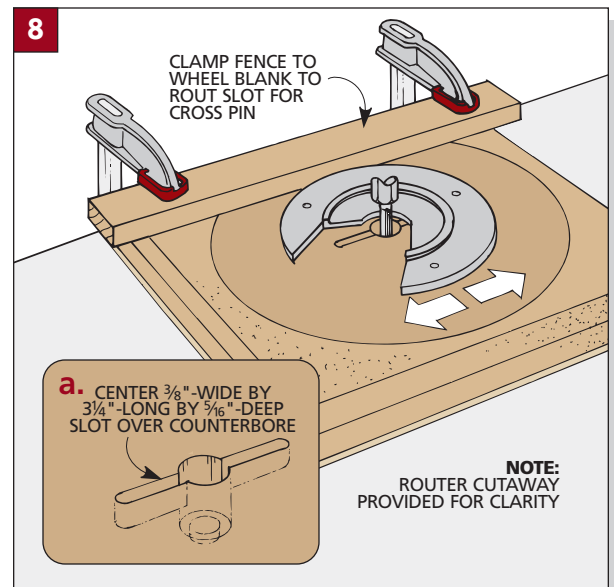
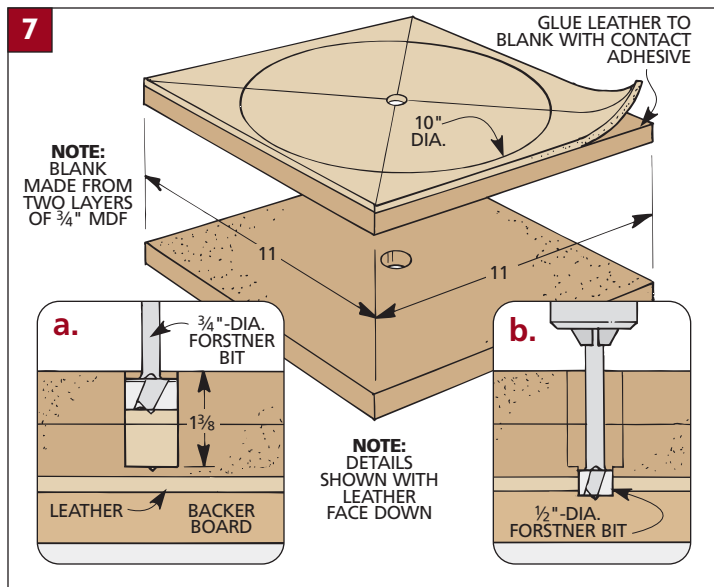


I didn't want to rely on epoxy alone to hold the wheel to the rod. So I decided to use a cross pin through the rod as well (*Fig. 6*). In order to hold the cross pin, a shallow groove is routed in the bottom of the wheel blank (*Fig. 8a*). I made this groove with a hand-held router and a simple fence (*Fig. 8*). The length of the slot isn't critical, but make sure it's centered over the counterbore.

CUT OUT WHEEL. When you've finished making the hole and slot for the rod and cross pin, you can cut the wheel out of the

blank on a band saw (*Fig. 9*). While it's possible to cut circles on the band saw, the edge can sometimes have blade marks. Since it's important to have a smooth, true edge for sharpening, I just cut as close to the layout line as possible, staying on the waste side of the line. Later the wheel is mounted in the drill press and a jig is used to true it up.

WHEEL SHAFT. The shaft that passes through the wheel is a piece of $\frac{1}{2}$ "-dia. steel rod (also available at hardware stores). After cutting it to length, you'll

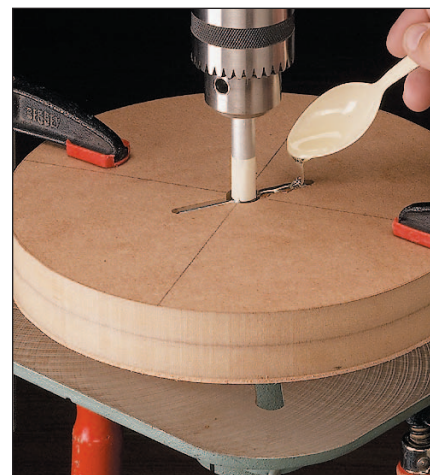
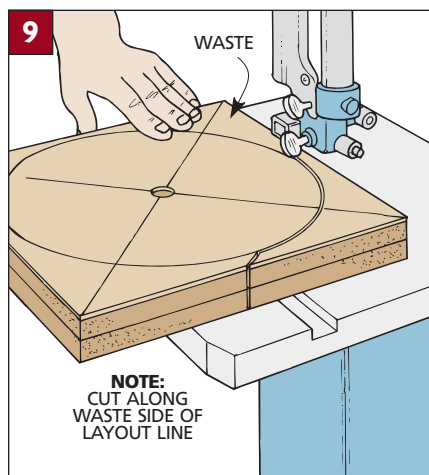


need to drill a cross hole for the pin. To help hold the rod while drilling it, I made a simple V-block for my drill press. (For another option, refer to the Adjustable V-Block article starting on page 34.) Then I clamped the rod and block down to my drill press while drilling the hole.

The cross pin is cut from a piece of $\frac{3}{16}$ "-dia. steel rod. After slipping the pin into the cross hole in the shaft, test the fit of the shaft and cross pin in the wheel. When everything fits, you're ready to epoxy the shaft into the wheel.

EPOXY. There are a few things to point out here. First, to get the wheel as square to the shaft as possible, I clamped it to the drill press table and chucked up the shaft while gluing it in place (see photo at right). And to ensure a good hold, I used a slow-setting, high-strength epoxy.

Once the epoxy is dry and scraped flush, the wheel needs to be trued up.



I used a straight bit in my router and a simple jig to do this. For the details, take a look at the box below. The last step is to glue a strip of sandpaper around the edge of the wheel (Fig. 7).

To provide a solid connection between the shaft and the wheel, a cross pin is installed through the shaft. This keeps the shaft from spinning inside the wheel. Epoxy locks everything together.

SHOP JIG

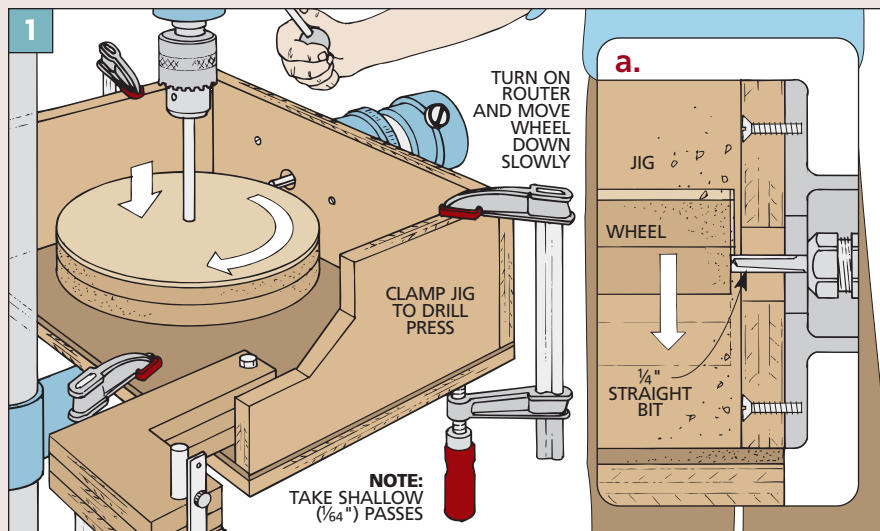
Wheel-Truing Jig

When cutting out the wheel, I just cut it to rough shape on the band saw. But for the jig to put a keen edge on a tool, the wheel has to be perfectly round and the outer edge has to be smooth. In order for the wheel to run as smoothly as possible, I decided to true it up on the drill press after it was epoxied to the shaft. To do this, I used a router and a simple jig.

BOX AND ROUTER. The wheel-truing jig is just a three-sided plywood box that supports the router (Fig. 2). The router is mounted to the front of the jig and then the whole thing is clamped down to the base of the sharpening jig and the drill press table (Fig. 1). Position the jig so that the bit is just below the wheel and there's enough clearance below the wheel to raise and lower the wheel. The bit should be in line with the center of the shaft.

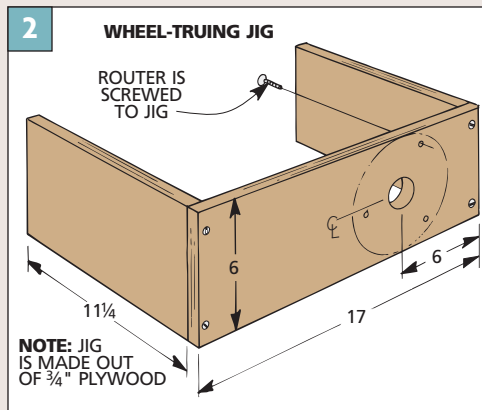
The wheel is trued by raising it up and down as it spins past the rotating router bit. At first, this may seem a little unusual (and perhaps a little intimidating). But you'll see that it works quite well. However, there are some important safety points to keep in mind.

SLOW AND EASY. First and foremost, you need to position the router to take light passes (no more than $\frac{1}{64}$ " deep), lowering the bit after each pass. You're really just shaving off material from the high spots of the wheel.



The second thing to remember is to *go slowly*. The drill press should be running at its slowest speed. And you should also lower the wheel down onto the router bit very slowly. If the router bit starts to grab or the wheel starts to chatter, slow down on the feed rate, take a lighter pass, or both.

After several passes, you'll have a smooth, trued-up wheel. Now glue on a strip of sandpaper and cut a long scarf joint at the overlap (refer to Fig. 6 on the opposite page).



SETUP

All the pieces are built, so you're almost ready to start sharpening. But first, the jig needs to be set up.

Start by placing the shaft of the wheel in the bearing of the base and then setting the jig on the table of your drill press. Now raise the drill press table up so that you can tighten the drill press chuck around the shaft of the wheel.

After you've tightened the chuck, give the wheel a spin by hand to see if it rotates without binding. If it turns freely, you can clamp the jig down to the drill press table. Then you'll need to lower the drill press table and base a couple of inches. This will give you clearance to raise and lower the wheel while sharpening.

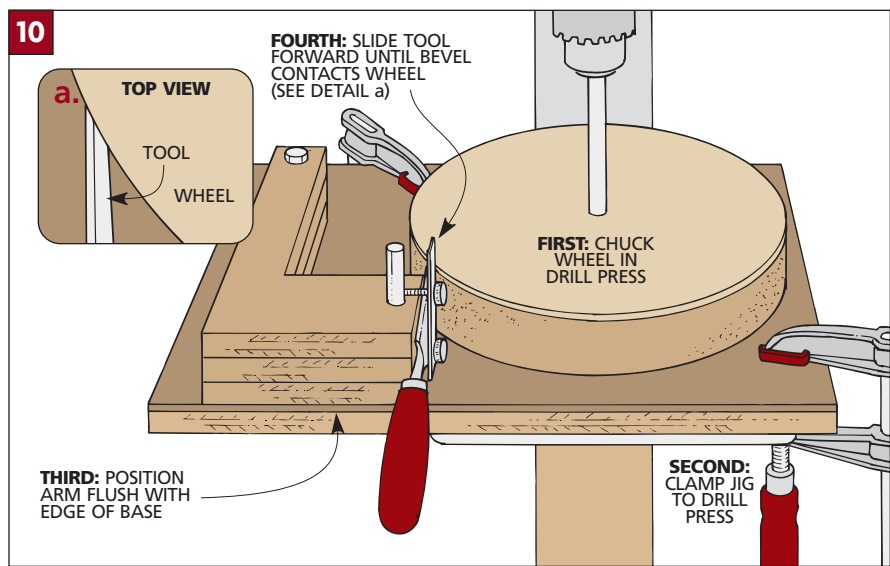
BEVEL ANGLE. With the jig attached to your drill press, you're ready to clamp a chisel or plane iron in place.

This jig is designed to grind a 30° bevel (approximately). In order to set up your tool for grinding at this angle, all you have to do is position the arm so that the front edge is flush with the front edge of the base (Fig. 10). Then insert the blade under the clamp plate, resting on the tool support. Now slide the tool forward until the bevel just contacts the wheel. Finally, tighten down the thumb screws to hold the tool in place.

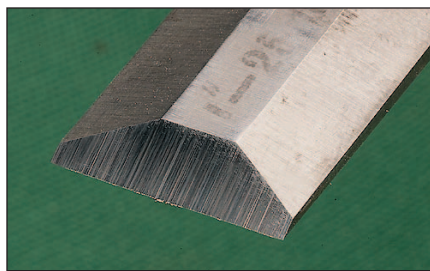
That's all there is to it. If you wish to change the bevel angle slightly (to match an existing bevel, for example), all you have to do is slide the tool forward or back a little bit before clamping it in place.

SHARPENING

Sharpening a tool with this jig couldn't be much easier. All you have to do is gently press the tool against the wheel while moving the wheel up and down.



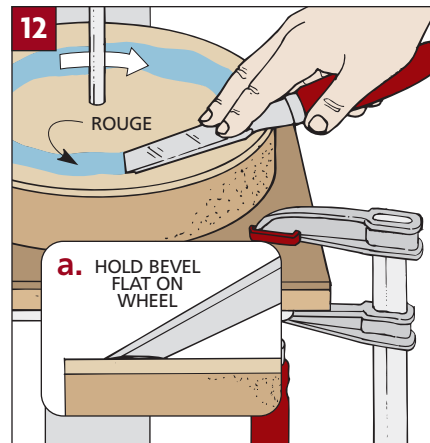
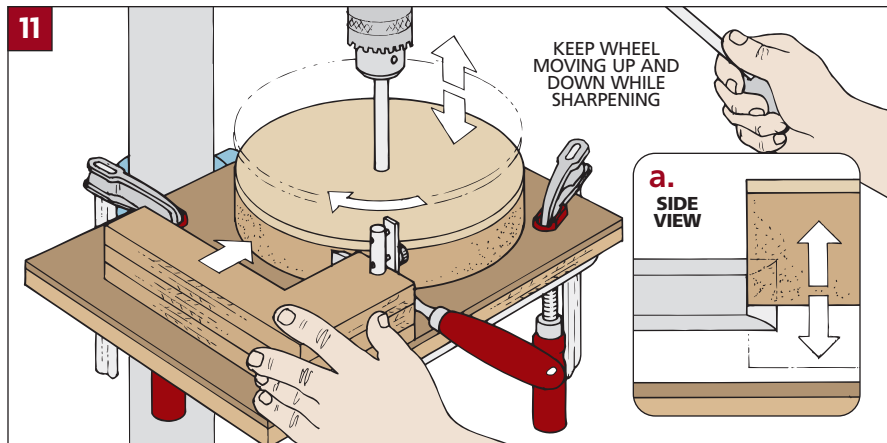
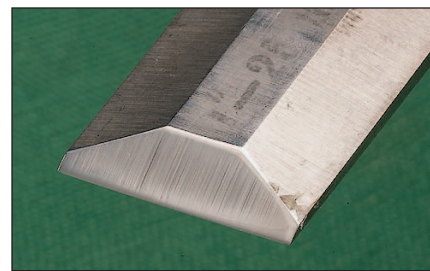
There are just a few things to keep in mind. The first two deal with keeping the blade from getting too hot. First, make sure that your drill press is set to run at its slowest speed. Second, keep the wheel moving across the face of the tool while sharpening (Fig. 11). And you don't need to (and shouldn't) press the tool too hard against the wheel. Let the sandpaper do the work. The result of this step will be a hollow ground edge (photo below).



The curve of the wheel creates a hollow-ground edge on a blade. This makes honing and touch-ups go quickly, since there is less metal to remove at the edge.

In that photo, you can see the scratches running from the tip of the blade up the bevel. The next step removes those scratches and gives the tool a keen edge.

HONING. For the sharpest cutting edge, you'll need to hone the tool after sharpening it. To do this, charge the leather on the wheel with rouge or honing compound. Then hold the tool against the leather and strop the edge to a mirror-like polish (Fig. 12 and photo below). ■



SHOP INFO Tapping Threads

When making the Sharpening Wheel, you'll need to drill a few holes and then tap them.

Tapping is nothing more than using a special tool that's designed to cut threads inside a hole. But don't worry if you haven't done this before. It's an easy process.

LAYOUT. Start by marking the location of each hole. Then, to keep the bit from wandering as you drill, you'll need to make a dimple with a metal punch (Step 1).

Note: Cut a V-groove in a couple of pieces of scrap to make a handy holder for the workpiece.

DRILL HOLE. Now you're ready to drill the hole. The thing to keep in mind is that the final size of the hole should be slightly smaller than the diameter of the tap. This leaves enough metal for the tap to cut the threads.

Note: Each tap has a specific size "pilot" hole that you need to drill.

Also, depending on the final hole size, it's a good idea to drill a series of pro-



gressively larger holes (Step 2). This prevents the bit from heating up too much and possibly breaking.

For the 10-32 tap I used, I started with a $\frac{3}{32}$ "-dia. drill bit and finished up with a $\frac{5}{32}$ "-dia. bit. Adding a drop or two of oil as you drill allows the bit to cut smoothly.

CHAMFER. Before tapping the hole, there's one more thing I like to do. To help center the tap, slightly chamfer the hole (Step 3).

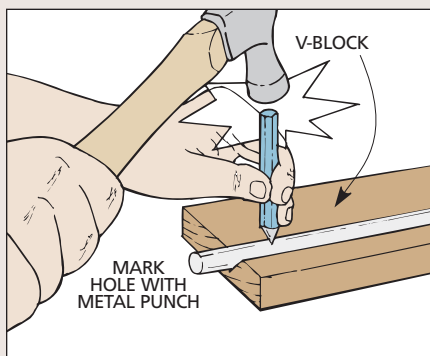
TAP THREADS. Now you're ready to fit the tap in a T-handled wrench and add a few drops of oil to make it cut more easily (Step 4).

To keep the tap from binding as you cut the threads, the goal is to start the tap straight. Then, with a little downward pressure, rotate the tap clockwise about a half-turn until it starts to cut (Step 5). After cutting a few threads, back the tap off to allow the waste to drop free.

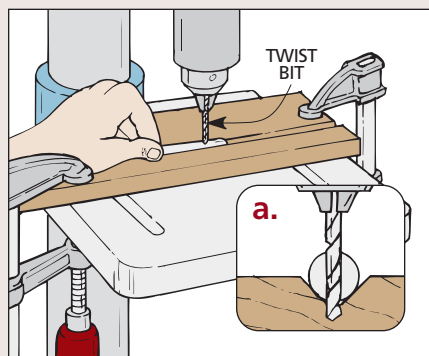
Although it's tempting to cut the threads all the way down, you could stress the tap and break it. So it's

best to only do a half-turn at a time, then a quarter-turn back to clear the tap until all the threads are cut.

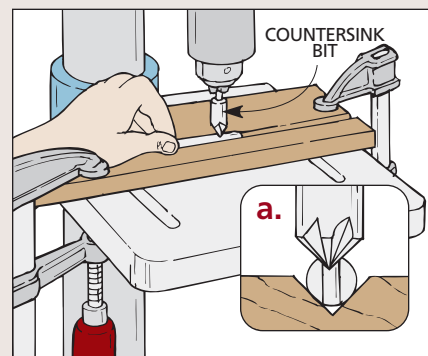
CLEAN-UP. Once the length of the hole is tapped, run the tap through the hole a couple of times to clean up the threads and clear away any remaining shavings.



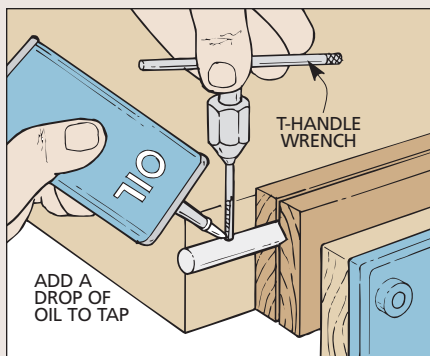
1 To prevent the drill bit from wandering as you start to drill, use a metal punch to create a dimple in the rod.



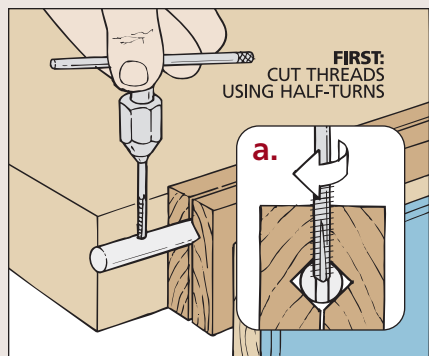
2 Start by drilling a small hole. Then increase the diameter of the hole using progressively larger drill bits.



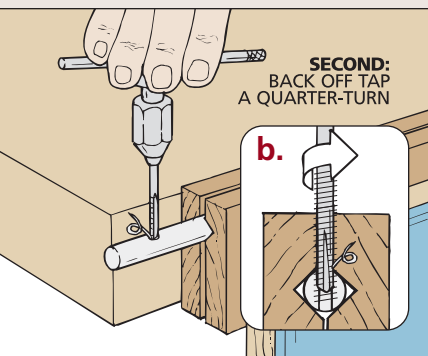
3 To help center the tap and make it easier to start, use a countersink bit to cut a slight chamfer around the rim of the hole.



4 Now position the tap so it's straight up and down. Then add a few drops of oil to the tap threads for lubrication.

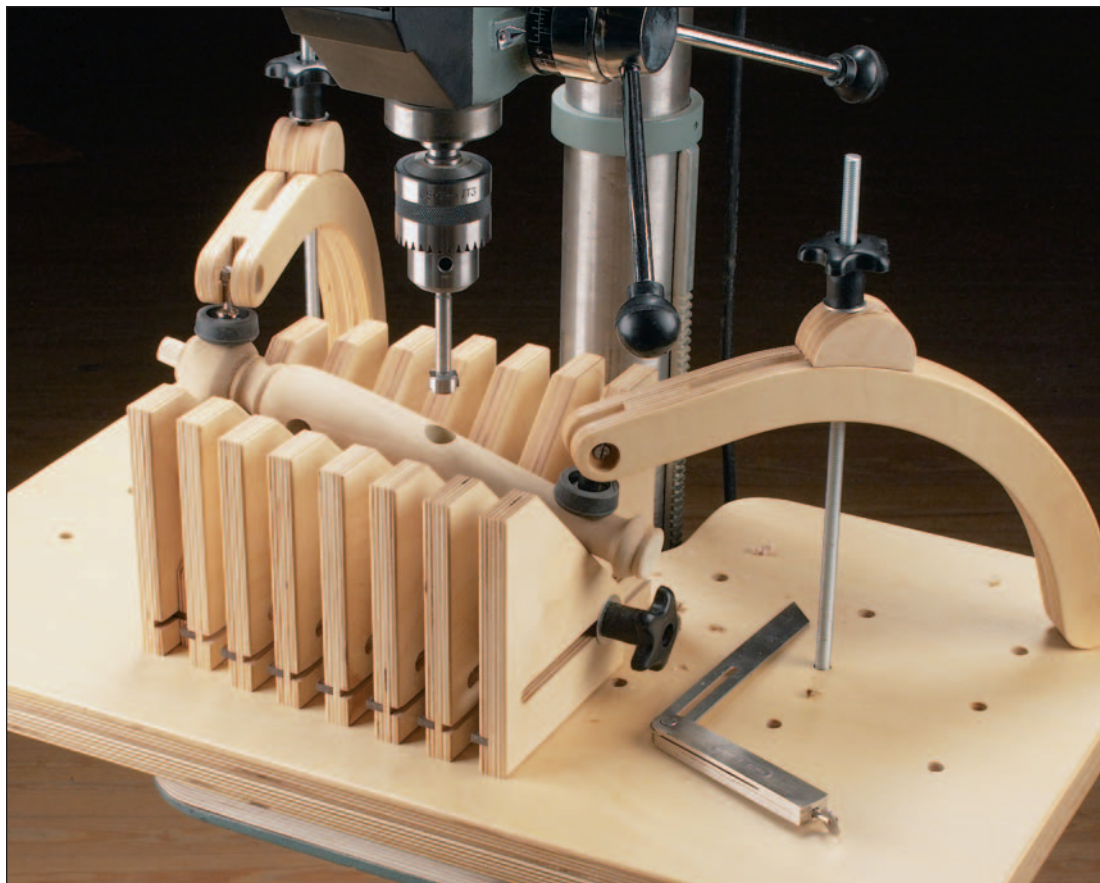


5 With the tap straight up and down, begin cutting the threads (left). After each half-turn, back off the tap a quarter-turn to clear the waste (right). Then just repeat the process until the threads are cut all the way through.



Adjustable V-Block

At first glance, it may look like something from a science fiction movie. But this versatile jig is the extra pair of hands you've always needed to hold oddly-shaped workpieces at the drill press.



Have you ever tried to drill a hole in a dowel or odd-shaped object, like a turned leg? Then you probably know how frustrating a job it can be. It's a real challenge to hold these kinds of workpieces steady and accurately on the flat table of a drill press. And it's even trickier if you have to drill an angled hole. Usually, I wind up cobbling together some jury-rigged device to support the workpiece in question. But since building this adjustable V-block system, that's no longer a problem.

PLATES. It only takes one look to know that this isn't your ordinary, run-of-the-mill V-block. Instead of being made out of

a solid piece of wood, this V-block is made up of sliding "plates." The plates interlock like fingers, and they slide in or out independently to conform to an infinite number of shapes and sizes. From long dowels to cabriole legs to perfect spheres, this V-block is versatile enough to hold just about anything.

TABLE. The V-block is only part of the system, however. There is also a drill press table that you can make to be used with the V-block. It bolts right on to your standard drill press table and provides a large, flat surface for the V-block to sit on. But more importantly, it also features some unusual hold-downs that can get a

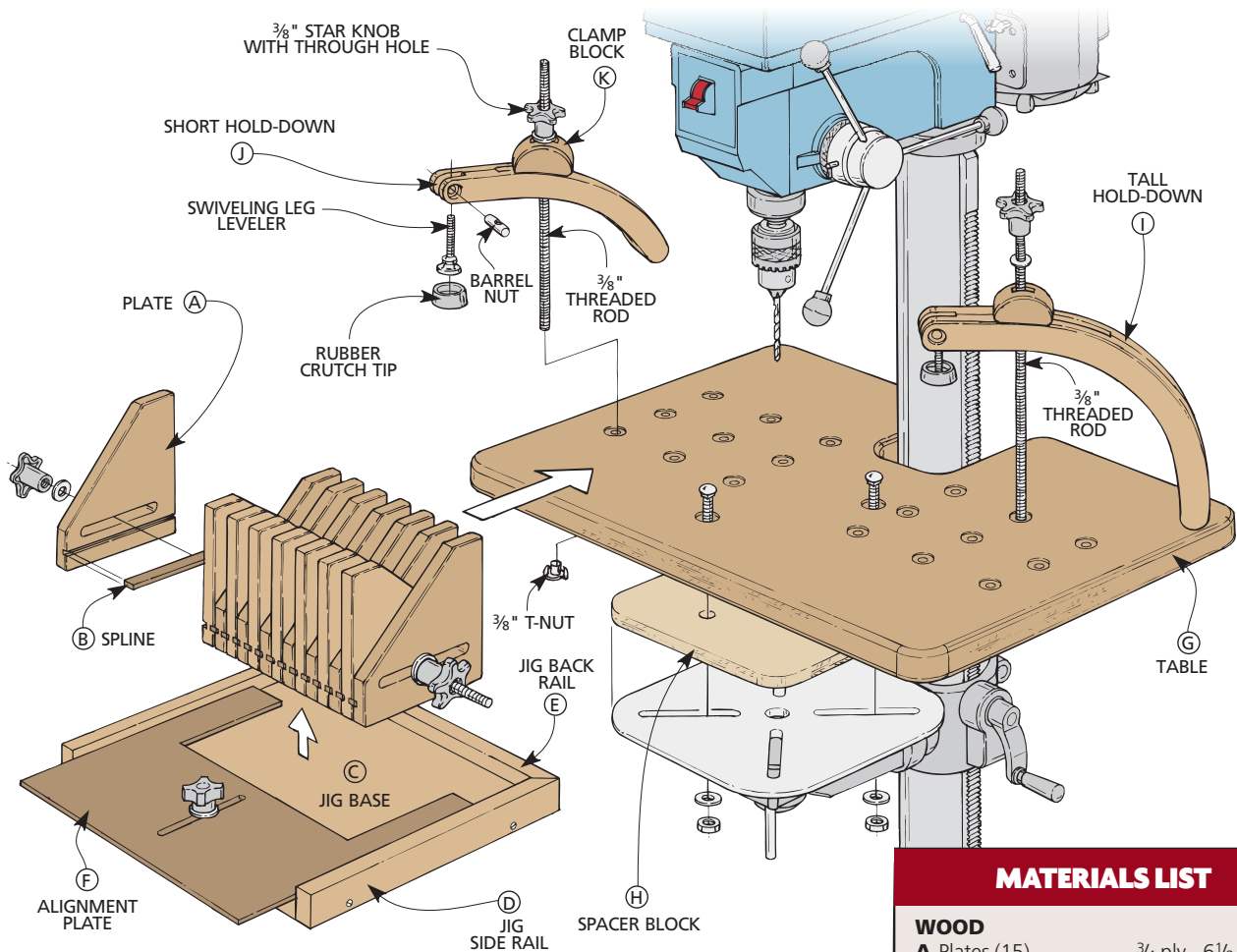
secure grip on awkward workpieces. In fact, the table and hold-downs work so well that you might want to use them even when you're not using the V-block.

HOLD-DOWNS. Each hold-down is secured to the table by a long threaded rod. A series of holes in the tabletop each have a T-nut that the rod can thread into. So you can position the hold-downs where they work the best.

The head of each hold-down pivots to conform to odd shapes and angles. While a star knob makes it easy to apply plenty of pressure, the head has a padded end that provides plenty of grip, yet prevents damage to the workpiece.

EXPLODED VIEW

OVERALL DIMENSIONS:
30W x 20D x 14H

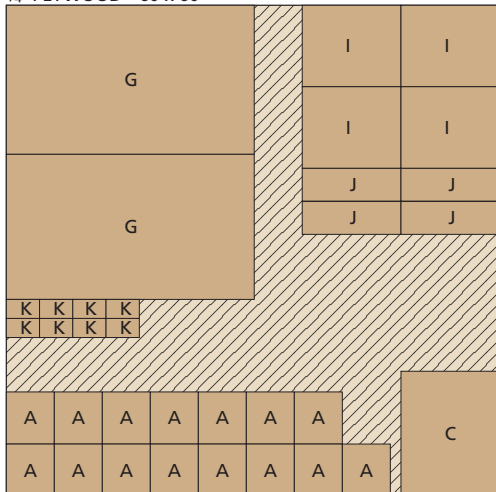


CUTTING DIAGRAM

$\frac{3}{4}$ x $3\frac{1}{2}$ - 48 (1.2 Bd. Ft.)

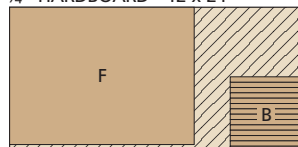


$\frac{3}{4}$ " PLYWOOD - 60 x 20



NOTE: ALSO NEED 6" LENGTH OF $\frac{3}{8}$ " DOWEL FOR PART L. CUT PART H FROM WASTE PLYWOOD

$\frac{1}{4}$ " HARDBOARD - 12 x 24



MATERIALS LIST

WOOD

A Plates (15)	$\frac{3}{4}$ ply - 6 $\frac{1}{2}$ x 6
B Splines (14)	$\frac{1}{4}$ hdbd. - $\frac{7}{16}$ x 6
C Jig Base (1)	$\frac{3}{4}$ ply - 12 x 15 $\frac{5}{16}$
D Jig Side Rails (2)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 12 $\frac{3}{4}$
E Jig Back Rail (1)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 16 $\frac{13}{16}$
F Alignment Plate (1)	$\frac{1}{4}$ hdbd. - 11 $\frac{1}{2}$ x 15 $\frac{1}{4}$
G Table (1)	1 $\frac{1}{2}$ ply - 20 x 30
H Spacer Block (1)	$\frac{3}{4}$ ply - custom fit
I Tall Hold-Downs (2)	1 $\frac{1}{2}$ ply - 10 x 12
J Short Hold-Downs (2)	1 $\frac{1}{2}$ ply - 4 $\frac{1}{2}$ x 10 $\frac{11}{16}$
K Clamp Blocks (4)	1 $\frac{1}{2}$ ply - 2 $\frac{1}{2}$ x 15 $\frac{1}{16}$
L Alignment Pins (8)	$\frac{3}{8}$ dowel x $\frac{1}{2}$

HARDWARE SUPPLIES

- (6) No. 8 x 1 $\frac{1}{2}$ " Fh woodscrews
 - (6) $\frac{3}{8}$ " star knobs (w/ through hole)
 - (1) $\frac{3}{8}$ " threaded rod (60")
 - (7) $\frac{3}{8}$ " washers
 - (19) $\frac{3}{8}$ " T-nuts
 - (1) $\frac{3}{8}$ " star knob (w/ 1"-long stud)
 - (4) $\frac{1}{4}$ " barrel nuts
 - (4) $\frac{1}{4}$ " swiveling leg levelers
 - (4) 1"-dia. rubber crutch tips
- Note:** Also need carriage bolts, nuts, and washers for attaching table to drill press.

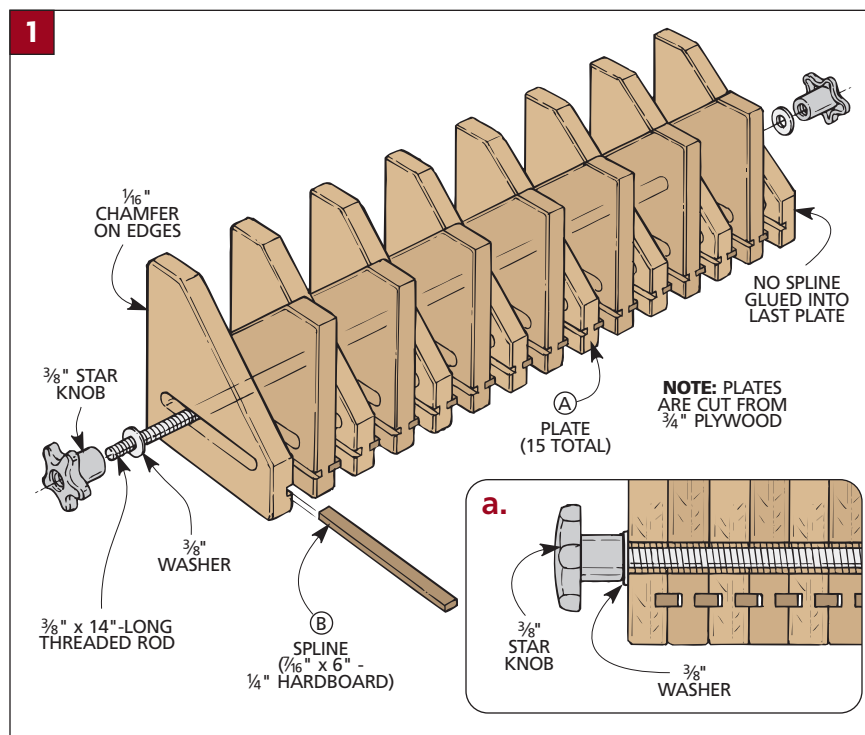


The V-block makes it easy to drill a hole in a dowel or round stock. The individual plates of the V-block can be adjusted to accept oddly-shaped workpieces.

PLATES

With its fifteen interlocking plates, this V-block looks like the backbone from some sort of prehistoric creature. But building the V-block is made a little easier due to the fact that all the plates are more or less identical (*Fig. 1*).

Each plate (A) starts off as a rectangular piece of $\frac{3}{4}$ " plywood (*Fig. 2*). After cutting all the plates to size, the next step is to cut a groove on each side of thirteen plates. (The two end plates are



grooved on only one side.) Later, splines will fit in these grooves to align the plates.

The grooves are sized to match the thickness of the $\frac{1}{4}$ " hardboard that will be used to make the splines (*Fig. 3*). I cut each groove by making two passes over a combination blade.

The next step is to cut a slot in each plate for the hardware that will be used to hold the plates together. Making each

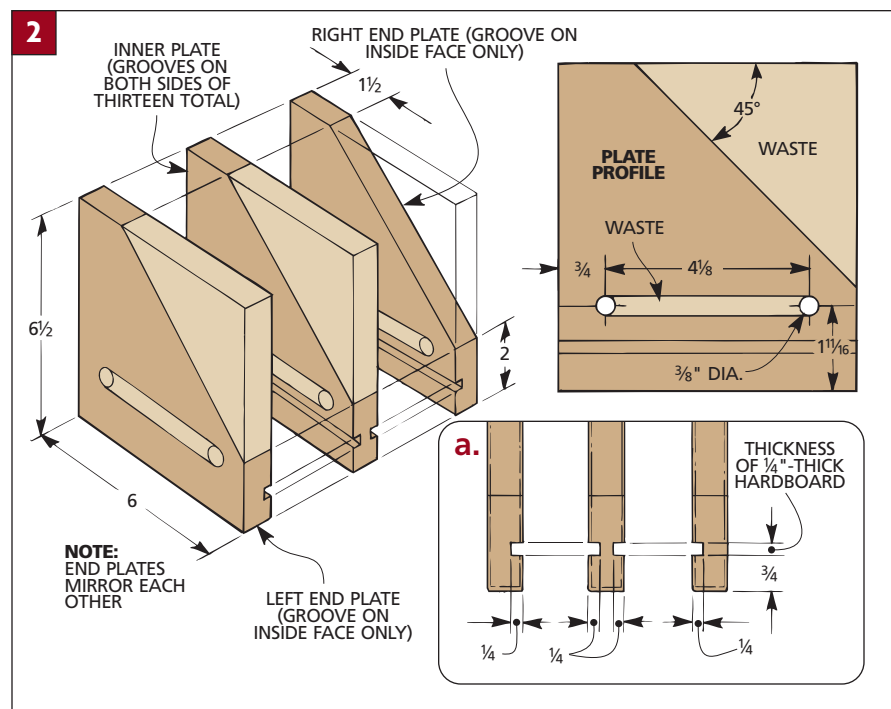
slot is a two-step process. First, $\frac{3}{8}$ "-dia. holes are drilled to establish the ends of each slot. The holes are different distances from the edges. So to drill them, I set up a fence with a couple of stop blocks on my drill press. The material between the two holes is removed on a router table in several passes (*Fig. 4*).

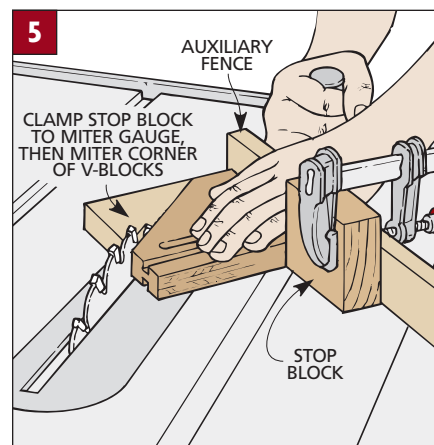
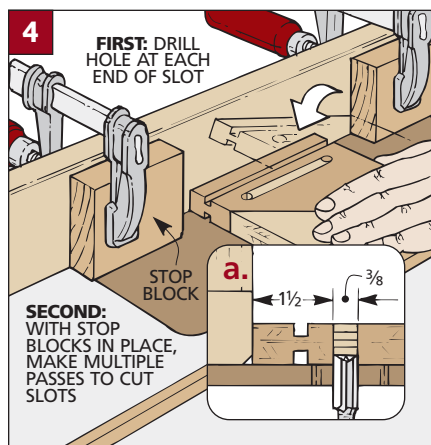
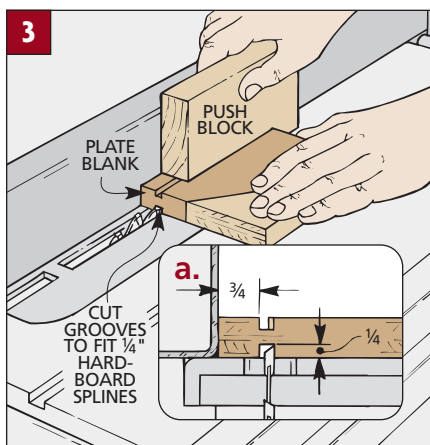
Once you've finished routing the slots in the plates, you can cut each plate to its final shape by mitering one corner. I did this on the table saw, setting up an auxiliary fence and a stop block on my miter gauge (*Fig. 5*). The last step to complete the plates is to rout a $\frac{1}{16}$ " chamfer around each of the edges.

SPLINES. Hardboard splines keep the plates aligned. There's nothing complicated about these. Each spline (B) is simply cut from $\frac{1}{4}$ " hardboard (*Fig. 1*). I allowed for $\frac{1}{16}$ " of clearance between the spline and the bottom of the groove in the next plate (*Fig. 1a*).

Each plate has a spline glued into one side except for one of the end plates, which has no splines (*Fig. 1*). But before ever picking up my glue bottle, I dry-assembled the splines and plates to help keep everything organized.

HARDWARE. After the splines are glued in place, the plates can be assembled and the hardware added. All that you need here is a length of threaded rod with a couple of star knobs, and a pair of washers below the knobs (*Fig. 1*).





ALIGNMENT JIG

If you are drilling into oddly-shaped workpieces, you can adjust the plates of the jig individually to match the size and shape of your workpiece. But for drilling straight holes in dowels or round stock, you want the plates to create a level, even “V” in the block. And the depth of the “V” depends on the diameter of the workpiece. So I came up with a simple jig that pushes all the plates into perfect alignment (see the photos at right).

The alignment jig starts out as nothing more than a plywood base (C). A T-nut is installed near one edge of the base, then

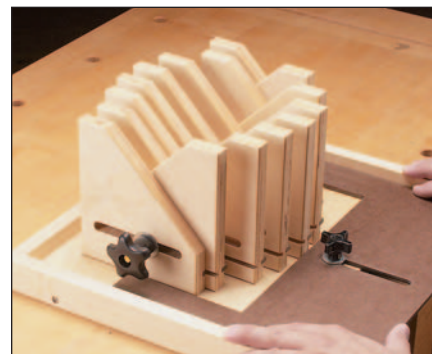
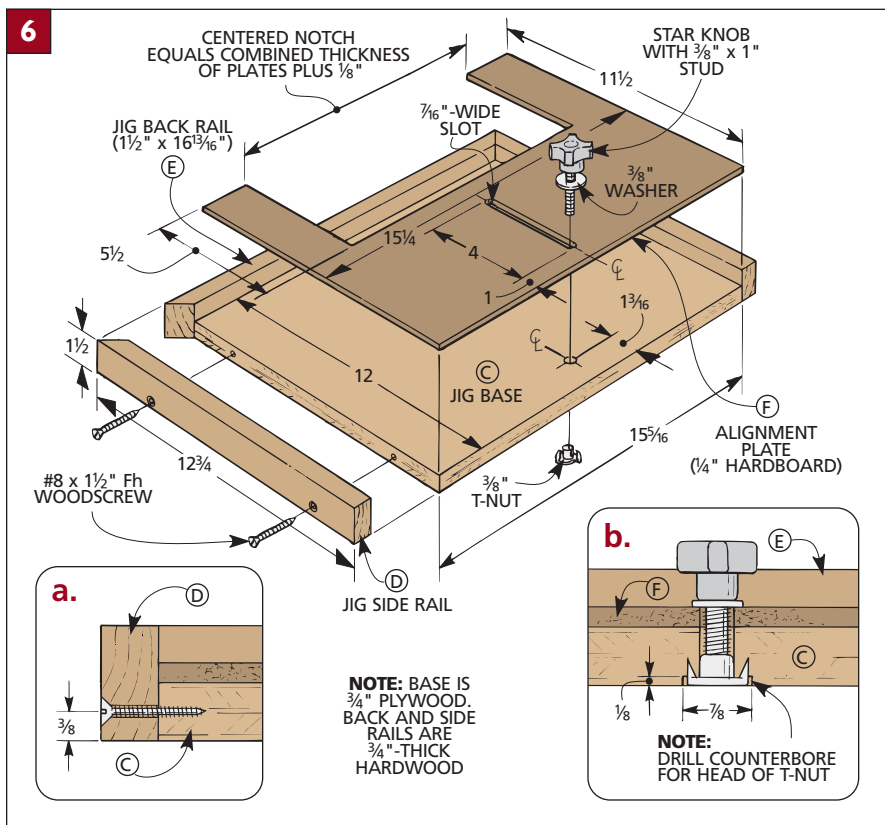
hardwood rails (D, E) are mitered on one end. These are glued and screwed to three sides of the base (Figs. 6 and 6a).

The last part to make for the alignment jig is the alignment plate (F). This is a piece of 1/4" hardboard cut to size to fit between the two side rails of the base. A 7/16"-wide slot is cut in the middle of the plate for a knob with a threaded stud. (This slot should be positioned so that it will line up with the T-nut that is already installed in the base of the jig.)

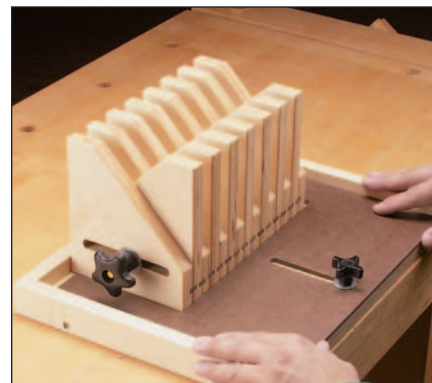
Before adding the alignment plate to the jig, you'll need to cut a large notch along the back edge. The width of the notch matches the length of the V-block.

This way when you are using the jig, the V-block will be surrounded on all four sides by the jig, making it a snap to quickly square up the plates (see the photos below). For a shallower valley, push the alignment plate all the way to the back rail. To make a deeper valley, just lock the plate in place where you need it.

Now you can move on to building the drill press table and hold-downs.



Aligning the plates of the V-block is quick and easy with this simple jig. Start by placing the V-block in the jig and loosening the knob on the through rod.



Push the alignment plate back to align the plates. For a deeper, wider valley, tighten the knob to lock the alignment plate in position, then move the plates to it.



Even without the V-block, the hold-downs and the drill press table will prove to be valuable accessories.

DRILL PRESS TABLE

The drill press table is an important part of the V-block system. It makes the V-block easier to use, especially when it's combined with the hold-downs (refer to *Fig. 8* and the photo above). But the nice thing about this table is that you'll get plenty of use out of it even when you're not using the V-block.

The table (G) is made up of two layers of $\frac{3}{4}$ " plywood (*Fig. 7*). I started by cutting the layers slightly oversize. Then after gluing them together, I trimmed the table to finished size.

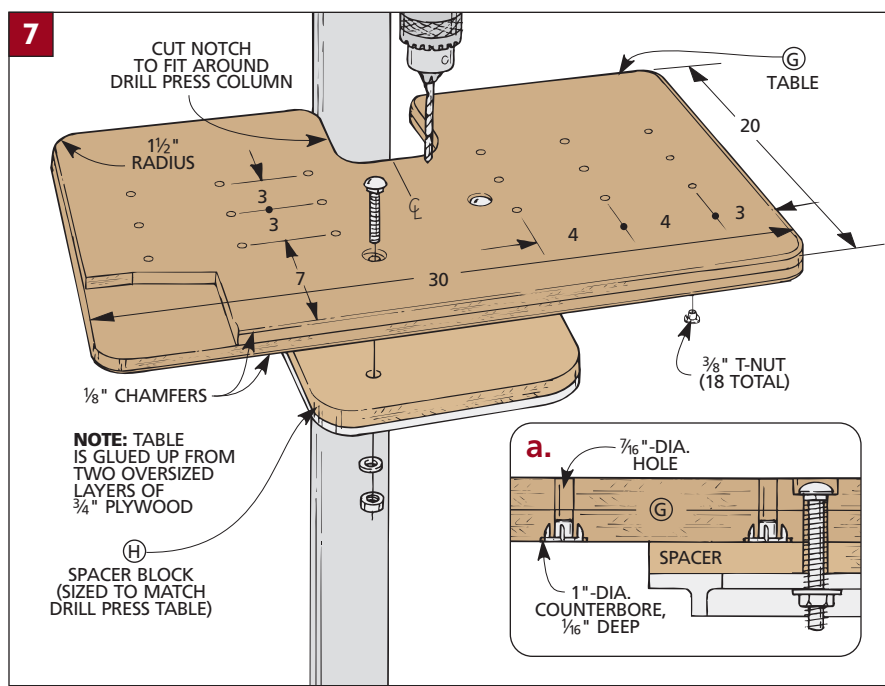
The next step is to mount T-nuts in the bottom of the table. These will be used to attach the hold-downs that will be added later. In order to give you plenty of options when using the hold-downs, there are 18 T-nuts in all (*Fig. 7*).

After the T-nuts are installed, the corners of the table can be rounded, and a notch can be cut out of the back to fit around the drill press column (*Fig. 7*). Then the edges are chamfered.

MOUNTING THE TABLE. I attached the table to my drill press with some carriage bolts, washers, and nuts. But once I had the table in place, I discovered a slight problem. On my drill press, there wasn't enough clearance at the back of the table to turn the hand crank that raises and lowers the table. So I had to add a spacer block (H) between the plywood table and the metal drill press table. I just used a piece of $\frac{3}{4}$ " plywood.

HOLD-DOWNS

The tall and short hold-downs (I, J) are designed to work like an extra pair of hands — they hold the workpiece down



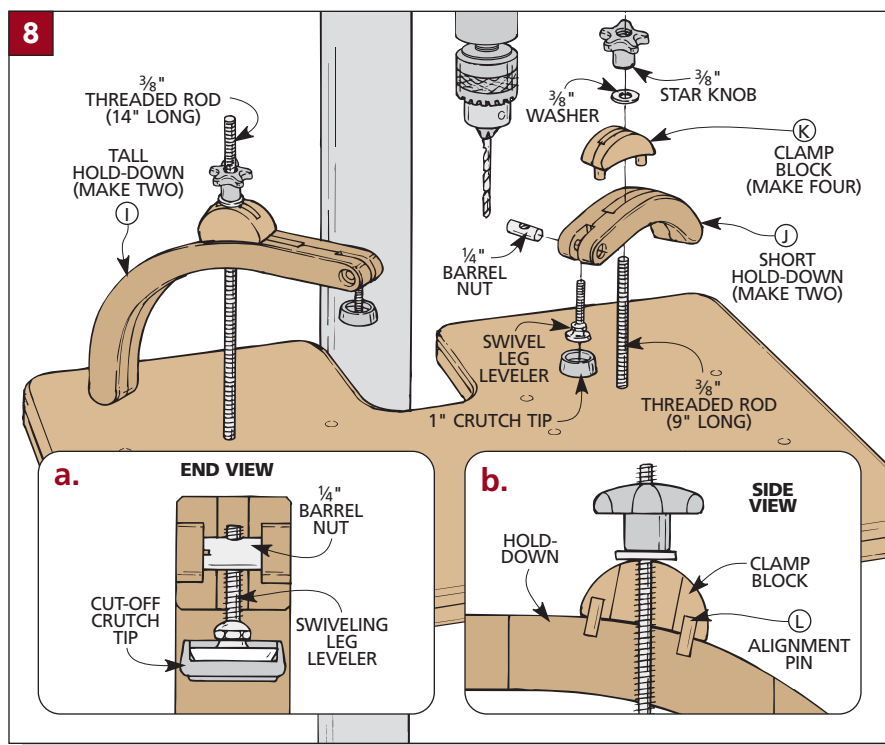
firmly to the table while you operate the drill press. There are two parts to each hold-down: a long, boomerang-shaped body and a semi-circular clamp block that, along with a threaded rod and star knob, secures the hold-down to the table.

I made two pairs of hold-downs — a tall set to use with the V-block and a short set that can be used by themselves (see photo above). Each $1\frac{1}{2}$ "-thick hold-down is glued up from two rectangular pieces

of $\frac{3}{4}$ "-thick plywood. The only difference is the size of the hold-downs (*Fig. 9*).

Each hold-down has a long, narrow slot in the middle where a threaded rod passes through (*Fig. 8*). Instead of trying to make this slot after the hold-down is assembled, I made it before the blanks were glued together.

To do this, I simply cut a wide, shallow groove on the inside face of each blank (*Fig. 9*). And I also cut a rabbet on the



The clamp pad on each hold-down is easy to make. It uses readily available hardware. First, a threaded leg leveler is screwed into a barrel nut. Then the end of a rubber crutch tip is cut off and slipped over the leg leveler.



edge of each blank to create an opening for the hardware that is added later.

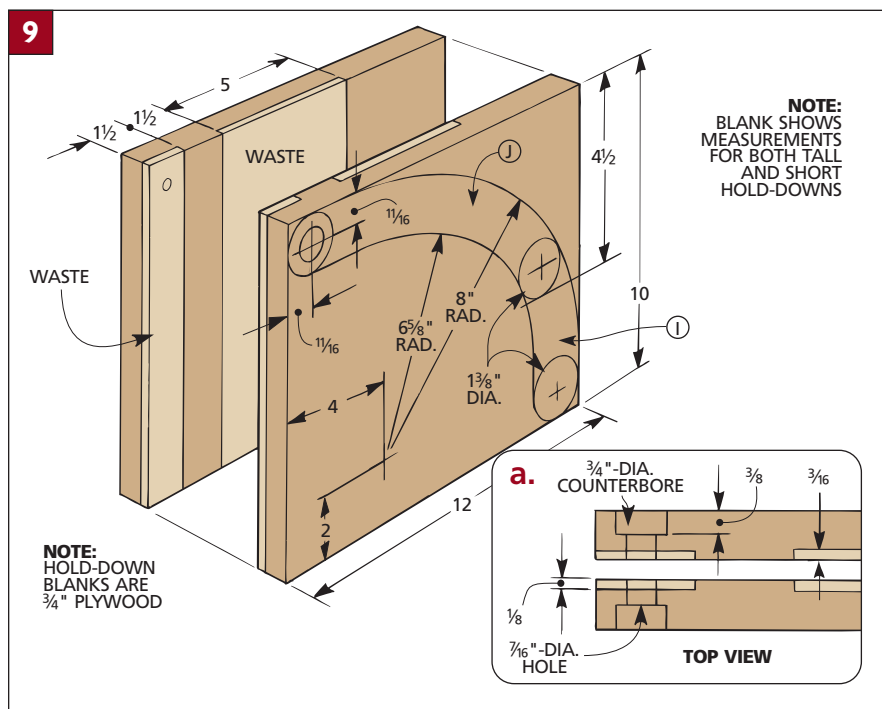
To keep the two blanks aligned during the glue-up process, I used a spacer block (Fig. 10). (Wax the block thoroughly to prevent it from being glued in place.)

After the glue is dry, you can lay out the profile and cut the hold-down to shape. A drum sanding attachment on the drill press will take care of any saw marks. Then you can rout a small chamfer on each edge.

CLAMP PAD. The clamp pad on the end of each hold-down is made up of off-the-shelf hardware items — a barrel nut, a swiveling leg leveler, and a rubber crutch tip (see photo above).

In order to accommodate the barrel nut, a hole is drilled through the end of the hold-down. This hole is counterbored from both sides to make the installation of the nut easier (Fig. 9a).

CLAMP BLOCK. The little clamp block (K) that sits on top of the hold-down is also glued up from two pieces of plywood.



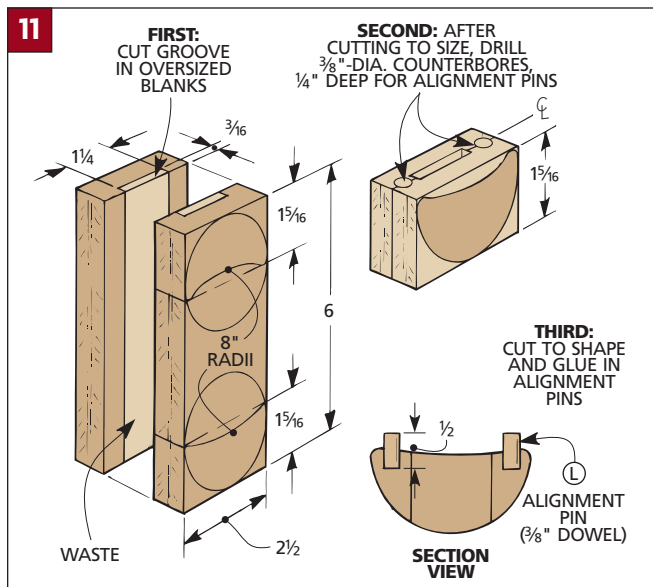
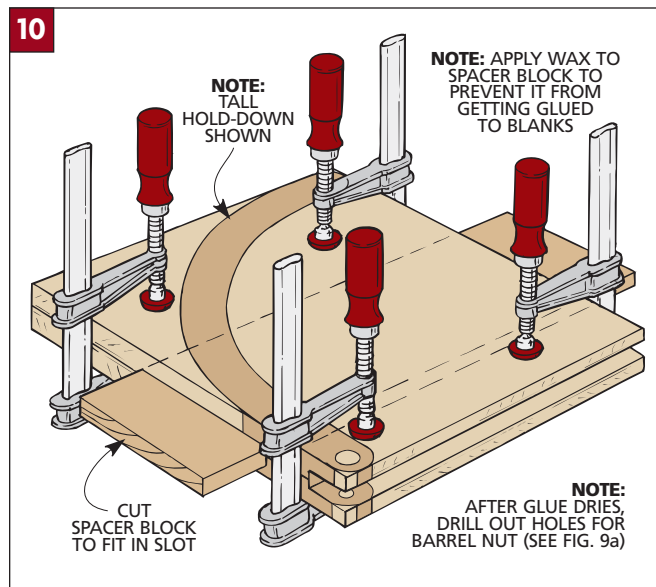
A groove cut down the center of each piece creates an opening in the center of the block, just like with the hold-downs. Because these pieces are so small, I started with a single, extra-long (12") plywood blank, cut to width (Fig. 11). I cut the groove down the center for the opening, and then cut the blank in half and glued the two pieces together.

After the glue is dry, you can lay out the profile of the clamp blocks and crosscut the strip into individual blanks. Before cutting the blocks to shape, though, you'll need to drill a couple of holes in each block for alignment pins

that are added later (Fig. 11). These pins will fit into the slot in the hold-down and help keep the two pieces aligned when the knob is tightened.

After cutting the blocks to shape and sanding and lightly chamfering the edges, you can glue the alignment pins (L) into the holes (Fig. 11). These are nothing more than a couple of short lengths of wood dowel stock.

Finally, each block and hold-down can be mounted to the table with a star knob, a washer, and a length of threaded rod. The tall hold-downs need a 14" length, the short ones only 9" (Fig. 8).







ROUTER

Routers are easily one of the most versatile tools in a home workshop. With just a few jigs and accessories, any router can do amazing things.

Two projects in this section upgrade your router so you can use it in place of a jointer or planer. A third creates a device for making decorative carvings. And a pocket hole jig turns a router into a joinery machine.

You'll also find a couple of router tables here. One is floor-standing with built-in storage for accessories. The other, a benchtop model, is part of a system of five jigs built around a single auxiliary router base.

5-in-1 Router System

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5-in-1 Router System

It starts with a simple base plate for your router. The rest of these versatile router jigs attach to it. And best of all, you can probably build everything with just a handful of hardware and scrap lumber.



When you look at each of the jigs in the photos on the left, they appear to be five distinct jigs. So what makes them so special? Well, they aren't just stand-alone jigs. Instead, they're part of a 5-in-1 Router System.

BASE PLATE. The idea is pretty simple. You start by making a replacement base plate for your router out of hardboard (shown in the main photo above). This base plate is pretty handy in itself. Its large surface gives you a lot more support than the plate that comes with your router. And since it has straight sides, it tracks better along a fence.

THE SYSTEM. But the base plate's real function is to serve as the platform for the other pieces of the router system. An assortment of five different jigs can be built — all of which attach directly to the base plate. Attaching one of the jigs is

simply a matter of tightening a couple of knobs. And the jigs allow you to perform a variety of routing tasks, from flush trimming edging to creating mortises. There's even a pint-sized router table and fence that can be set up quickly on top of a table or workbench for small tasks.

I found this system was especially useful when I needed to take my router to work on a project outside the shop. It allowed me to put a whole shopful of jigs into a toolbox.

MATERIALS. One other benefit of this project is that you won't have to invest a lot in the way of time or materials. The only hardware required is a couple of toilet bolts, threaded knobs, and washers that fasten the jigs to the base, plus a few woodscrews and a nail. The jigs can be built almost entirely from scraps of plywood and hardboard.

MATERIALS LIST

WOOD

A Upr./Lwr. Plates (2) 1/4 hdbd. - 7 1/2 x 10

BASE PLATE

Since the base plate is the heart of the router system, it makes sense to build it first. The base plate is just a couple of pieces of 1/4" hardboard that are laminated together (*Fig. 1*). You can start by cutting the upper and lower plates (A) to identical size. But before gluing the two plates together, you'll need to rout some slots and drill some holes.

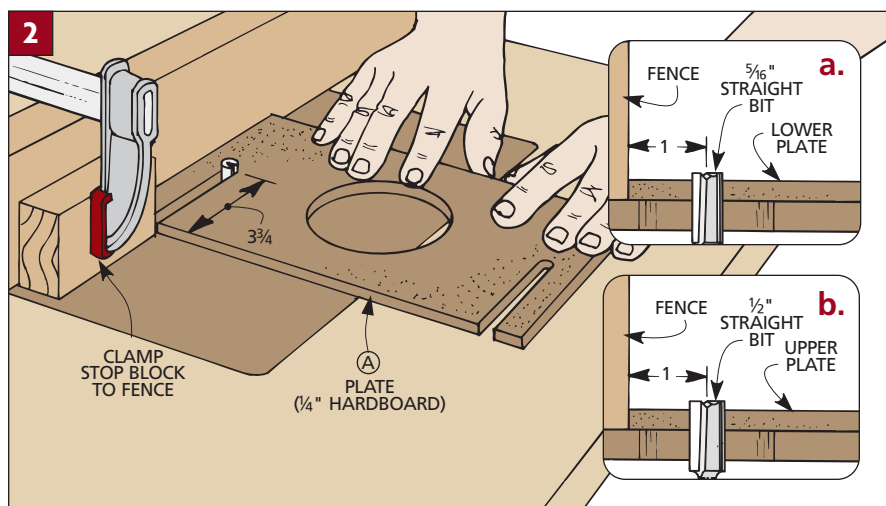
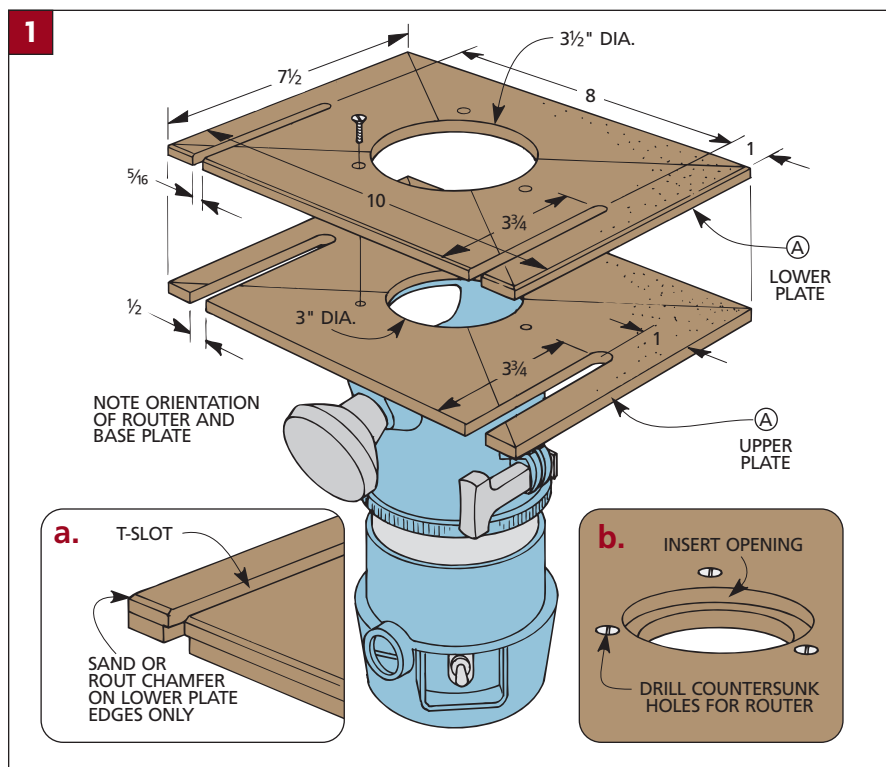
T-SLOTS. The router jigs will be attached to the base plate using toilet bolts that fit into T-slots (see photo below). These slots are created by routing a wide slot in the upper plate and a narrow slot in the lower plate. When the plates are sandwiched together, the result is a T-slot that's sized to hold the head of a toilet bolt. In order for this to work, the slots have to be carefully positioned on the plates. Although there are several ways to do this, I opted to cut the slots on a router table, using a fence and stop block to position each slot (*Fig. 2*).

By using the router table, I only had one setup to make. Once the fence and stop block are in position, you can rout the narrow slots in the lower plate (*Fig. 2a*). (Just flip the plate over to rout a slot on each side.) Then, without moving the fence or stop block, I changed over to a 1/2"-dia. straight bit and routed the slots in the upper plate. (This same technique is used later for making the slots on some of the other jigs as well.)

INSERT OPENING. In addition to the T-slots, the completed base plate has a stepped opening that will hold an insert ring (refer to page 49). As with the T-slots, making the opening is a two-step procedure. But this time, I used the drill



This hardboard base is the foundation of the 5-in-1 system. The toilet bolts secure the other accessories to the base.



press rather than the router table. After locating the centerpoint of each plate, a 3 1/2"-dia. hole is drilled through the center of the lower plate, and a 3"-dia. hole is drilled in the upper plate. These are good-sized holes, so I clamped each plate to a piece of scrap and used a wing cutter.

ASSEMBLY. Once the holes have been drilled, the two plates can be glued together. Just make sure the edges of the plates are flush as they are glued up.

After the glue is dry, you can drill the countersunk holes for the screws that will be used to attach the base plate to your router. To do this, I simply removed the factory base plate from my router

and used it as a template for drilling the mounting holes (*Fig. 1b*).

There's just one thing to keep in mind when doing this. You'll need to pay attention to the orientation of the router. The router should be mounted to the base plate so that the handles are parallel with the slots (*Fig. 1*). This way, the knobs used later to attach jigs to the base plate won't interfere with the router handles.

When the holes are drilled and countersunk, you can attach the base plate to your router. Because this base plate is thicker than the one that comes with most routers, you may need to find some slightly longer screws.



MORTISING JIG

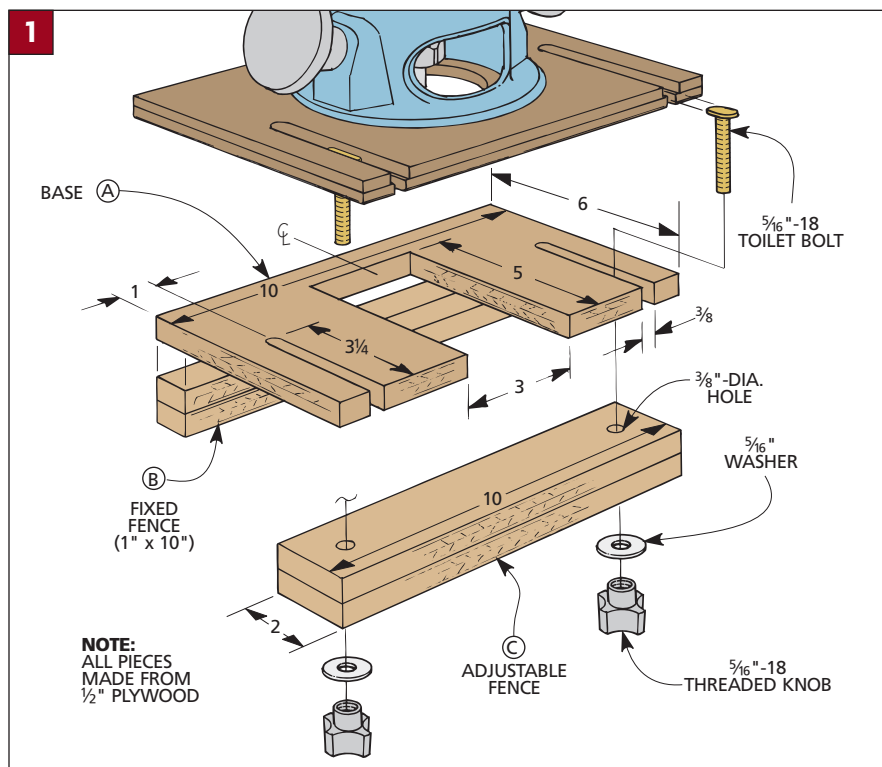
Routers are a great way to create clean, perfect-fitting mortises. But in order to get the best results, you need a mortising jig to guide the router in a straight path along the edge of the workpiece. That's where this router jig comes in. It has a pair of fences that straddle the workpiece and guide the bit in a straight line. And the jig is adjustable to allow for workpieces of varying thicknesses.

There are only three parts to this jig. The first is a base (A) that is cut from a piece of $\frac{1}{2}$ " plywood. It has slots at each end that align with the slots in the base plate (Fig. 1). In between the slots is a large, rectangular opening.

A fixed fence (B) is glued up from two strips of $\frac{1}{2}$ " plywood and is then glued flush with the back edge of the base. The adjustable fence (C) is a bit wider than the fixed fence, but it has a hole drilled at each end for a toilet bolt.

The mortising jig is mounted to the router base plate using a couple of toilet bolts, washers, and a pair of threaded knobs. The bolts fit into the T-slots in the base plate and pass through the slots in the base of the mortising jig and the holes in the adjustable fence (Fig. 1).

SET-UP GAUGE. To center the router bit between the two fences of the jig, I use



a simple set-up gauge. This is just a narrow piece of hardboard cut to match the thickness of the workpiece you are mortising. In the center of the gauge, a hole is drilled that matches the diameter of the router bit. Just slip the gauge over the bit and adjust the fences so the gauge is sandwiched between them (Fig. 2).

Note: You may want to make several gauges to match the thicknesses of stock you mortise frequently.

USING THE JIG. Once the jig is set up, you can start routing your mortises. With the router running, slowly lower the router and jig down over your workpiece, plunging the bit into the area you've marked for your mortise. Then rout the slot. I try not to remove more than a $\frac{1}{4}$ " of material at a time. For deeper mortises, you need to make multiple passes, lowering the router bit after each one.

One last thing. Although you can use a straight bit for routing mortises, I prefer to use a spiral upcut bit. The nice thing about these bits is that their spiral design pulls the chips up out of the mortise, giving you a cleaner cut and making it easier to see what you are doing. (See page 126 for sources.)

MATERIALS LIST

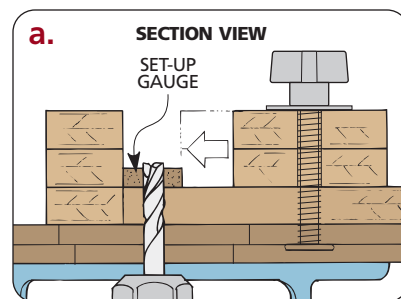
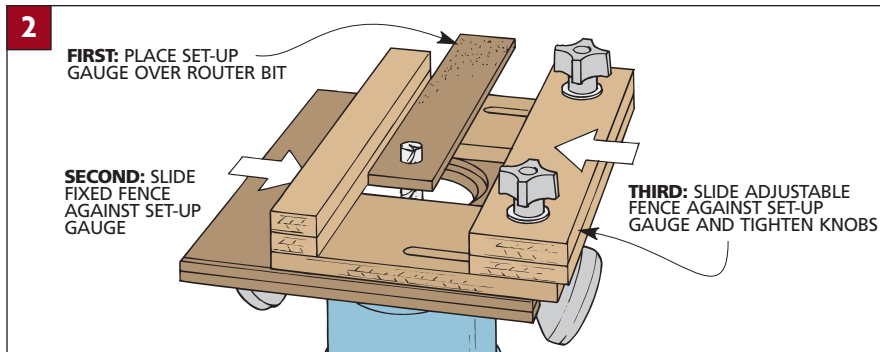
WOOD

A Base (1)	$\frac{1}{2}$ ply - 6 x 10
B Fixed Fence (1)	1 ply - 1 x 10
C Adjustable Fence (1)	1 ply - 2 x 10

HARDWARE SUPPLIES*

- (2) $\frac{5}{16}$ "-18 toilet bolts
- (2) $\frac{5}{16}$ " washers
- (2) $\frac{5}{16}$ "-18 threaded knobs

***Note:** This hardware is used to secure all jigs to base plate.



FLUSH TRIM JIG

Whenever I make a furniture project out of plywood, I usually add hardwood edging to hide the exposed edges of the plywood. And it's almost always easier to make this edging a little wider than necessary and then trim it flush with the plywood after it has been applied. A router and a flush trim bit make this a little easier, but it's still difficult to balance the router on the edge of the panel you are trimming. That's because there isn't usually enough surface for the router to rest on comfortably. And the slightest dip of the router can ruin a workpiece.

With this flush trim jig, the support surface for the router is "built-in." The base of the jig provides a wide, flat surface that rides against the side of the panel that you are flush trimming. This makes it a lot easier to hold the router steady.

MATERIALS LIST

WOOD

- A** Base (1) $\frac{1}{2}$ ply - 10 x 10
- B** Mounting Block (1) $1\frac{1}{2}$ ply - 3 x 10
- C** Handle (1) 1 ply - 4 x 6

HARDWARE SUPPLIES

- (2) No. 8 x $1\frac{1}{4}$ " Fh woodscrews

I made the flush trim jig by cutting a base (A) out of $\frac{1}{2}$ " plywood. A large opening is cut on one side of the base to provide clearance for the flush trim bit (Fig. 1). A jig saw or band saw can be used to cut this opening, and then the edges can be sanded smooth by hand or with a drum sander.

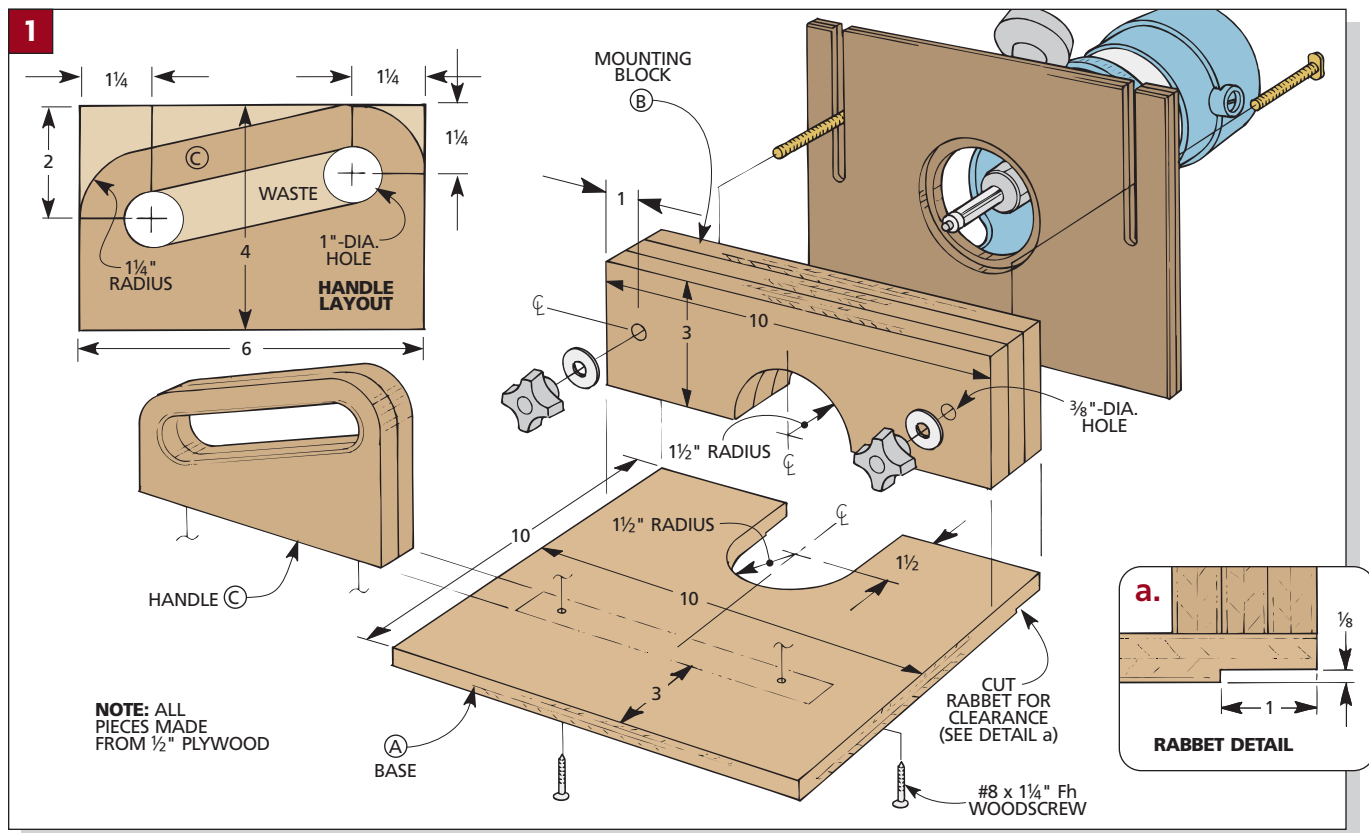
MOUNTING BLOCK. To attach the router to the jig, a mounting block (B) is added to the base of the jig. This block is glued up from three layers of $\frac{1}{2}$ " plywood. And then a $\frac{3}{8}$ "-dia. mounting hole is drilled at each end. Again, I used a jig saw to cut a semi-circular opening out of the middle of the fence, then sanded it smooth. The mounting block is then glued to the base, flush with the edge.

HANDLE. To make it easier to get a grip on the jig and to guide it, a handle (C) is added to the base. It's made from two layers of $\frac{1}{2}$ " plywood (Fig. 1). To create the opening for the handle, a hole is drilled at each end of the opening. Then the waste in between the holes is cut away with a jig saw. Once this is done, the inside edges can be sanded smooth. Finally, to make the handle more comfortable to grasp, all the exposed edges are rounded over with a router and a roundover bit. Then the handle is glued and screwed to the base of the jig.



There's just one last thing to take care of before using the jig. A clearance rabbet needs to be cut in the base of the jig to allow it to travel over the untrimmed edging (Fig. 1a). This shallow rabbet can be cut on a table saw.

USING THE JIG. To use this jig, start by installing a flush trim bit in your router. Then attach the jig to the baseplate using the toilet bolts, washers, and threaded knobs. You'll need to adjust the fence until the cutting edge of the bit is just flush with the base of the jig. An easy way to do this is to place a metal rule on the fence across the opening and then turn the bit by hand so the cutting edge just grazes the rule.





EDGE GUIDE

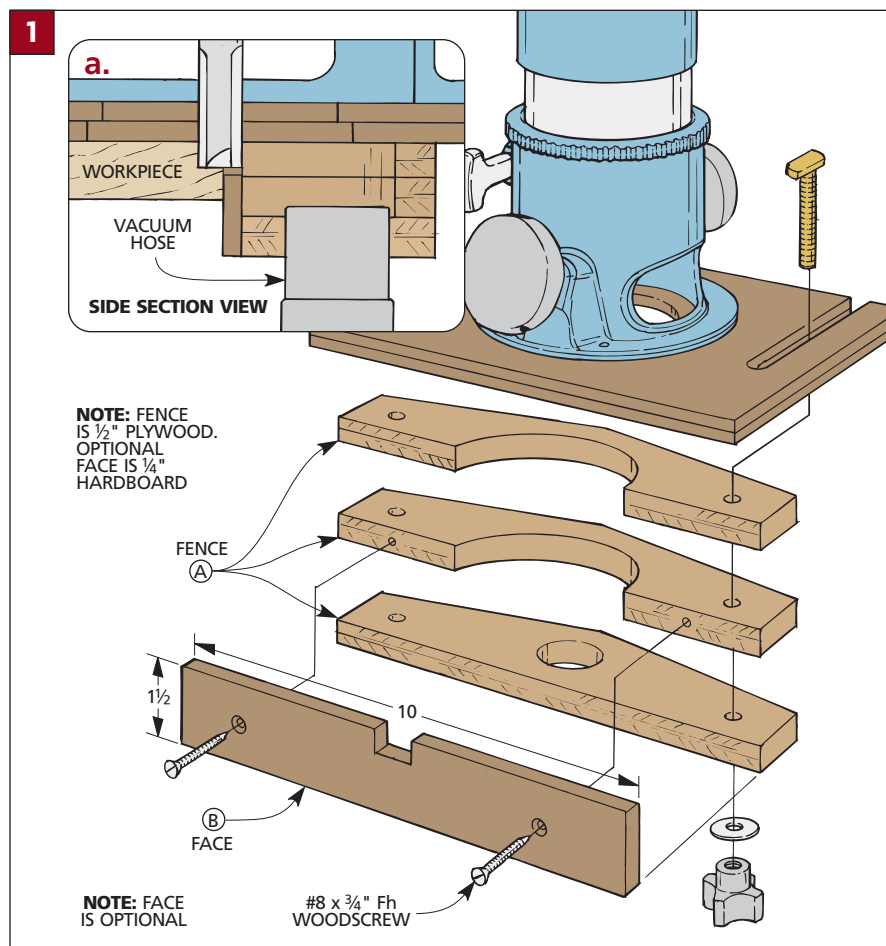
An edge guide for a router can come in handy any time you need to create a rabbet or rout a groove. But this edge guide has more to offer than most. It's designed so it can be hooked up to the hose of a shop vacuum, eliminating most of the dust and chips. (A 2 1/4"-dia. hose will work best, so you may need an adapter for your shop vacuum hose.)

FENCE. Of all the jigs in this system, the edge guide is probably the most basic. It's just a fence (A) made up of three layers of plywood (Fig. 1). To build it, start by cutting three identical pieces of 1/2" plywood. Two of these are glued together to form the top section of the jig. The third piece can be set aside for now.

Once the two layers are glued up, lay out a semi-circle on one edge, centered between the ends of the blank (Step 1 in Fig. 2). Then, using a band saw or jig saw, cut away the waste inside the semi-circle.

After sanding away the saw marks with a drum sander, the third piece of plywood can be glued to the other two. This bottom piece encloses the opening, so the chips are directed to the shop vacuum hose (Fig. 1a).

In order to attach the jig to the router base plate, you'll need to drill a couple of



holes for the toilet bolts. I used the base plate to mark the locations for these holes.

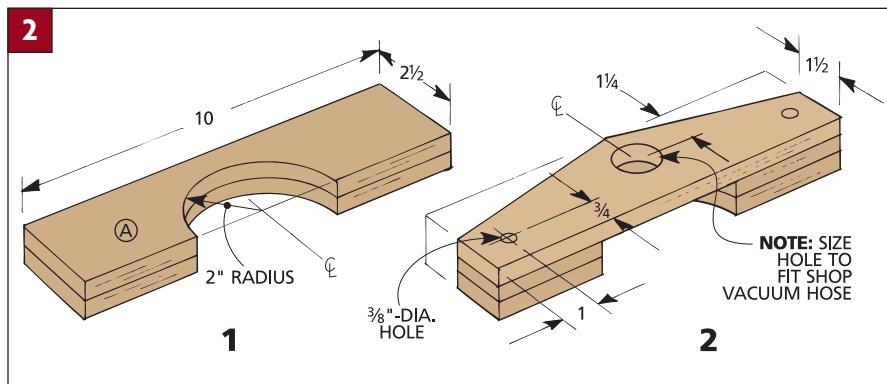
After this is done, a couple of tapers are cut along the back edge of the jig simply to help reduce the weight (Step 2 in Fig. 2). These tapers can be cut with a band saw or jig saw and then sanded smooth with a belt sander.

DUST COLLECTION. The last step to complete the jig is to drill a hole in the bottom for the nozzle of your shop vacuum. The trick here is to size the hole so you get a nice friction fit when you insert the nozzle of the hose. (I made

mine 1 3/8" in diameter.) If the opening ends up a little large, you can wrap a piece of duct tape around the nozzle of your hose to create a better fit.

To use the jig, simply attach it to the router base plate with the toilet bolts, washers, and knobs. Then adjust the jig in or out to position the groove or profile on your workpiece.

OPTIONAL FACE. The opening in the fence is extra large to accommodate slot-cutting bits. But if you are using bits with a smaller profile (such as a straight bit when cutting a rabbet), you may want to add a facing piece (B) to reduce the size of this opening. This is just a piece of hardboard with a clearance notch for the router bit (Fig. 1). The face is screwed to the fence so it can be removed.



MATERIALS LIST

WOOD

- A** Fence (1) 1 1/2 ply - 2 1/2 x 10
- B** Face (1) 1/4 hdbd. - 1 1/2 x 10

HARDWARE SUPPLIES

- (2) No. 8 x 3/4" Fh woodscrews



CIRCLE CUTTER

You can cut a circle out of wood using many different tools. But a router probably gives you the cleanest, most accurate results of any of them. The trick is to guide the router with a jig.

This circle cutter is nothing more than an adjustable auxiliary base that attaches to the base plate on the router. The jig slides in or out so you can cut circles varying from about 3" up to 18" in diameter. A pivot pin at one end of the jig fits into a small hole in the center of your workpiece, and the router then travels around this point.

The jig is made up of two layers — a hardboard plate (A) and a plywood plate (B). This allows you to create a pair of T-slots for attaching the jig. I used the same method as in making the T-slots in the base plate. A couple of $\frac{1}{2}$ "-wide slots are routed in the hardboard plate first. Then a pair of narrow ($\frac{5}{16}$ ") slots are routed in the plywood plate (Fig. 1).

After these slots are routed, the two layers can be glued together. Don't skimp on the glue, but use it sparingly around the slots. This way you won't have to worry about coming back later to clean up glue squeezeout.

Once the glue is dry, you can lay out and cut the large opening in the center of the jig. Again, this can be done with a band saw or jig saw, and the opening can be sanded smooth with a drum sander.

PIVOT PIN. The pivot pin is nothing more than a small nail. A hole is drilled in the jig near one edge, and then the nail is epoxied in place (Fig. 1a).

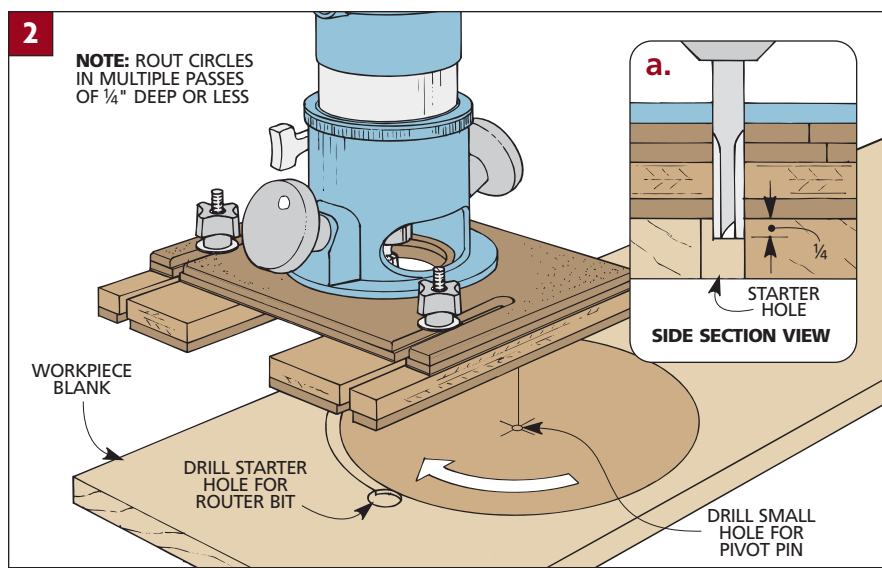
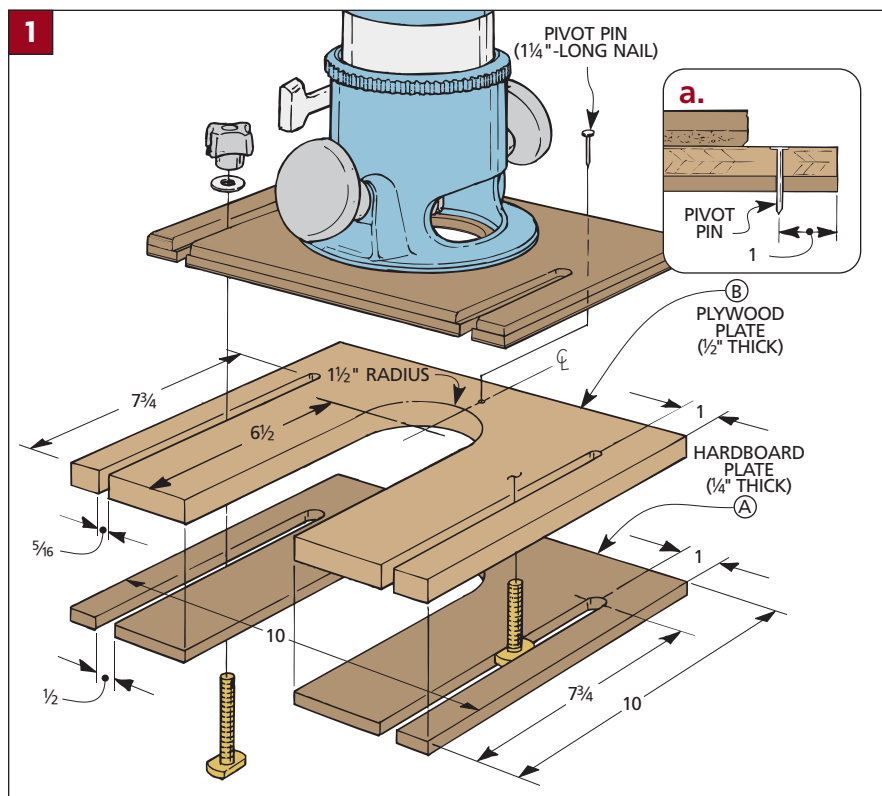
MATERIALS LIST

WOOD

- A** Hardboard Plate (1) $\frac{1}{4}$ hdbd. - 10 x 10
- B** Plywood Plate (1) $\frac{1}{2}$ ply - 10 x 10

HARDWARE SUPPLIES

- (1) $1\frac{1}{4}$ "-long nail



USING THE JIG. To cut a circle using the jig, start by laying out the circle and its centerpoint on your workpiece. Then drill a small hole at the centerpoint, just deep enough to fit the pivot pin.

Next, a larger hole is drilled at the edge of the circle. This hole will be used as a "starter" hole for the router bit, so it should be at least as large as the diameter of the bit. The hole needs to be in the waste area, so if you're going to make a hole in a workpiece, drill the starter hole *inside* the circle you've laid out. If you are

making a disc or wheel, drill the hole *outside* of the layout line (Fig. 2).

Now use carpet tape to secure the workpiece to a backer board clamped to your workbench. (The carpet tape is important — it will hold the circle in place once it is cut free from the workpiece.)

Set the router and jig on the workpiece so the pivot pin is in the small hole in the center of the circle and the router bit is in the starter hole. Now you can rout the circle in multiple passes, lowering the bit about $\frac{1}{4}$ " between each pass.



TABLE & FENCE

Compared to the other accessories, it's a little hard to think of this router table and fence as a "jig." But it uses the same base plate that all the other jigs do. The router (with the base plate) just drops into the table, and the toilet bolts hold the fence to the base plate.

And although the table may look a little small, the fence features a support wing on each end that makes the working surface 24" long. This allows you to handle longer pieces (see photo).

The table's small size makes it easy to take to the job. The whole thing can be clamped down on top of a stationary or portable workbench. And when you're finished, the router table can be stored underneath the bench or on a shelf.

OPEN BOX. The table is really just an open box that supports the router and base plate. The base plate fits into a shallow recess on the top of the box, and the router is suspended beneath it.

To make the table, I started by cutting out a bottom (A) and two sides (B) from $\frac{1}{2}$ " plywood. A couple of $\frac{1}{4}$ "-deep dadoes are cut in the bottom to hold the sides (Figs. 1 and 1b). I cut these on the table saw with a dado blade.

MATERIALS LIST

WOOD

A Bottom (1)	$\frac{1}{2}$ ply - $7\frac{1}{2}$ x $18\frac{1}{2}$
B Sides (2)	$\frac{1}{2}$ ply - $7\frac{1}{2}$ x 12
C Braces (2)	$\frac{1}{2}$ ply - 4 x 4
D Facing Strips (4)	$\frac{1}{2}$ ply - 1 x $12\frac{1}{4}$
E Cross Support (1)	$\frac{1}{2}$ ply - $3\frac{3}{4}$ x $9\frac{1}{2}$
F Top Fence Layers (2)	$\frac{1}{2}$ ply - $1\frac{1}{2}$ x 24
G Btm. Fence Layers (2)	$\frac{1}{2}$ ply - $1\frac{1}{2}$ x $10\frac{1}{4}$
H Support Wings (2)	$\frac{1}{2}$ ply - 4 x $6\frac{3}{4}$
I Insert Ring (1)	$\frac{1}{4}$ hdbd. - 3 dia.

While I had the dado blade in the table saw, I added a plywood auxiliary fence to the rip fence and repositioned it to cut a rabbet on one end of each side piece. These rabbets will support the base plate and router. To ensure a snug fit between the router table base plate and the sides of the table, it's important to size these rabbets carefully. And notice that the base plate stands proud of the sides of the router table by $\frac{1}{4}$ " (Fig. 1a). (I ended up making my rabbets $\frac{1}{4}$ " x $\frac{1}{4}$ ".)

There are two more pieces to make before you glue the sides into the dadoes in the base. To help stiffen the sides of the router table, I made a couple of triangular braces (C) (Fig. 1). After you've cut these out, you can glue everything together. Check that the base plate fits snugly between the sides of the table.

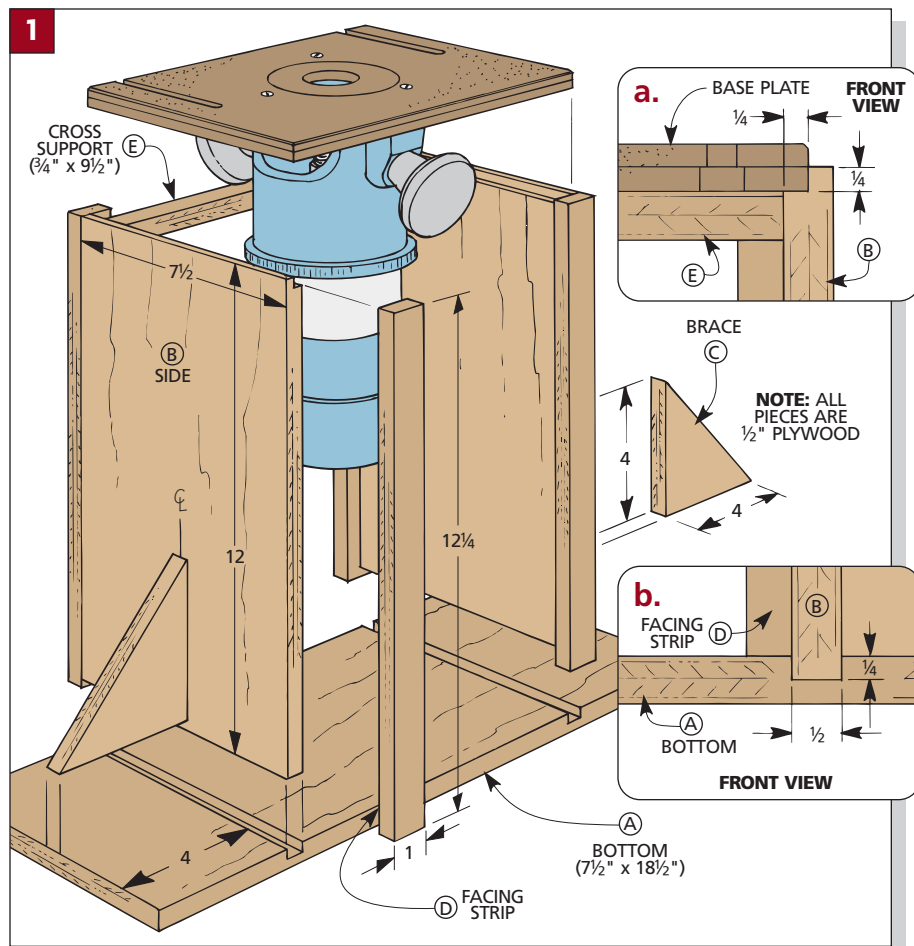
In addition to the braces, some facing strips (D) also help stiffen up the base.

These 1"-wide plywood strips are glued to the edges of the sides and extend down over the edge of the bottom. They also extend to the top of the rabbet in the router table sides to create a lip that locks the base plate in place (Fig. 2).

The last piece to add is a cross support (E). This plywood piece is simply glued between the two sides at the back of the router table, so it's flush with the bottom of the rabbets. The support helps hold up the back of the base plate. Plus it keeps the sides from buckling in when the router isn't in the table.

FENCE. With the table complete, you can start making the fence. The fence is just three layers of plywood that are glued together. It is secured to the base plate with the same toilet bolts, washers, and threaded knobs used to attach the other jigs. A couple of wings attached to the ends of the fence serve as infeed and outfeed supports, more than doubling the length of the table's worksurface.

The main section of the fence is made by gluing up two top fence layers (F) (Fig. 2). The bottom fence layer (G) is actually made up of two shorter pieces



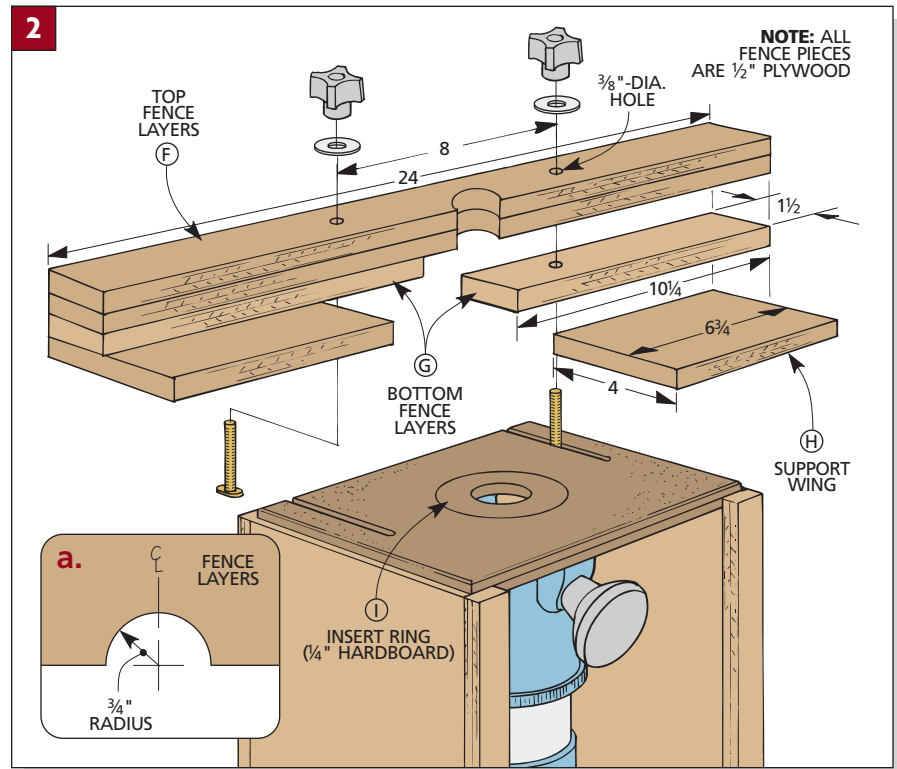
that are glued to the bottom of the longer pieces. These are glued flush with the ends of the fence, leaving a gap in between for router bit clearance.

Once all the layers are glued up, use the base plate to mark the locations of holes in the fence for the toilet bolts that are used to attach the fence to the base plate. After drilling these holes, you'll need to cut a small, semi-circular opening for router bits centered on the front edge of the fence (*Fig. 2a*). This opening can be cut out with a jig saw or band saw.

Finally, the support wings (H) are added to each end of the fence (*Fig. 2*). These are simply cut to size and glued in place, flush with the ends and back of the fence. They not only support long workpieces, they also help to guide the fence so it travels smoothly as you slide it back and forth over the top of the table.

INSERT RING. The large opening in the router base plate is convenient when you're using the router in a hand-held position. It allows you to see what you're doing a little better. But when the router is in the router table, it's safer to have a smaller opening around the bit. So I made an insert ring (I) that fits into the opening in the base plate (*Fig. 3*).

The insert ring is just a piece of 1/4" hardboard. It's cut out on the drill press, using a wing cutter. Start by using carpet tape to fasten a hardboard blank down to a backer board that is clamped to your drill press (*Fig. 4*). Now adjust the wing cutter to cut a disc that will fit the opening in the router base plate. The key is to size the disc so it fits in the opening snug,

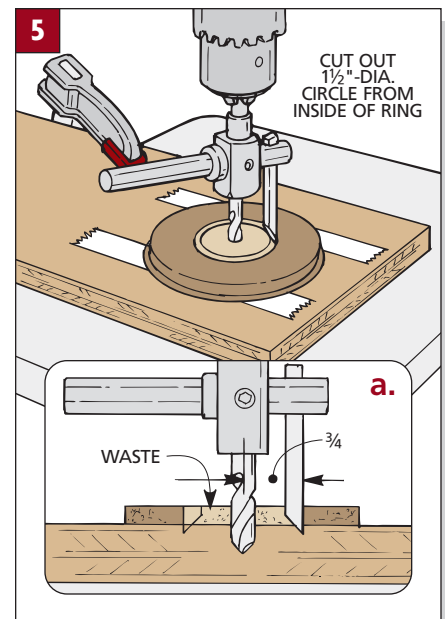
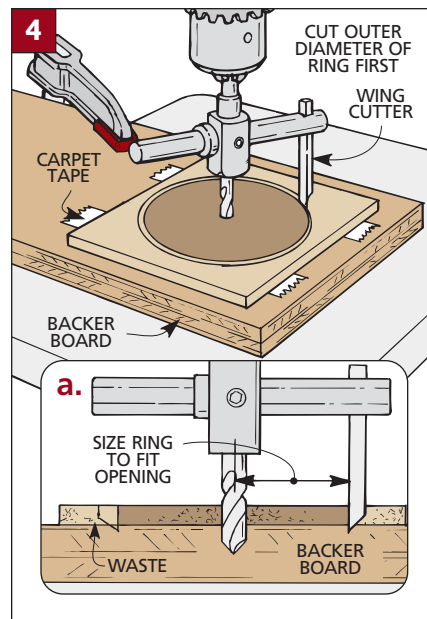
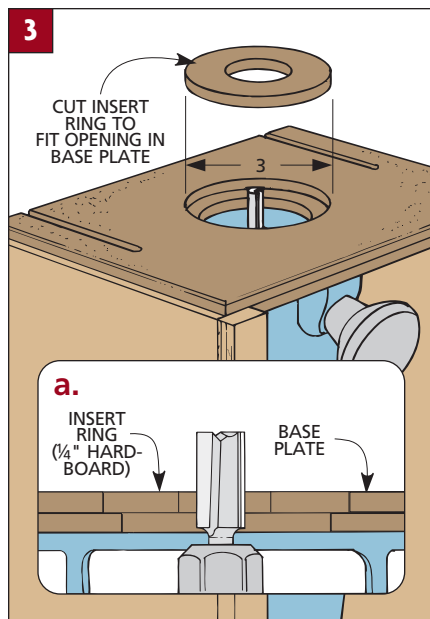


but not too tight. This may take a little bit of trial and error. I had to make a couple of discs before I got the wing cutter adjusted just right.

To create the opening in the insert ring, the wing cutter is re-adjusted to cut a smaller (1 1/2"-dia.) hole (*Fig. 5*). (Remember to turn the cutter around.) Of course, while you have the drill press set up, you can make up several insert rings with openings of various diameters to accommodate different bits.



The router table fence slides forward and back. Plus it provides infeed and outfeed support for workpieces.



Planing Jig

No planer? No jointer? No problem. Use your router to flatten and thickness panels, including those too wide for a jointer or planer. A special bit leaves a surface that only needs light sanding.



The inspiration for this jig came from a friend of mine who didn't have a planer or a jointer. He needed a way to flatten stock and bring it to thickness. After tossing around some ideas, we came up with the jig you see here. And in the process, we built a jig that can do some things a planer or jointer can't.

CUPPED AND WARPED STOCK. The jig is great for flattening a cupped or warped workpiece. After one face is flat, just flip the workpiece over and rout the board to whatever thickness you need.

The way it works is really rather simple. The router is fastened to a wide carriage that slides on a couple of rails.

The workpiece rests between the rails below the router. The router is then moved back and forth over the workpiece. Because the router stays at a fixed height, it removes the high spots from the board — in other words, it flattens it.

SMOOTH FINISH. Of course, my friend and I expected the jig to flatten and thickness a board. But after experimenting with different bits, we were surprised at how smooth we could make a board. They were so smooth that light sanding by hand was all that was necessary.

The secret to such a smooth finish is the special router bit we used. It's a 1"-dia. bottom-cleaning bit. (The Shop Info box

on page 53 tells you more about it.) Though the jig works best with this bit, you could use a regular straight bit — you just won't end up with a surface that's quite as smooth. So you'll have a bit more cleanup to do by scraping or sanding.

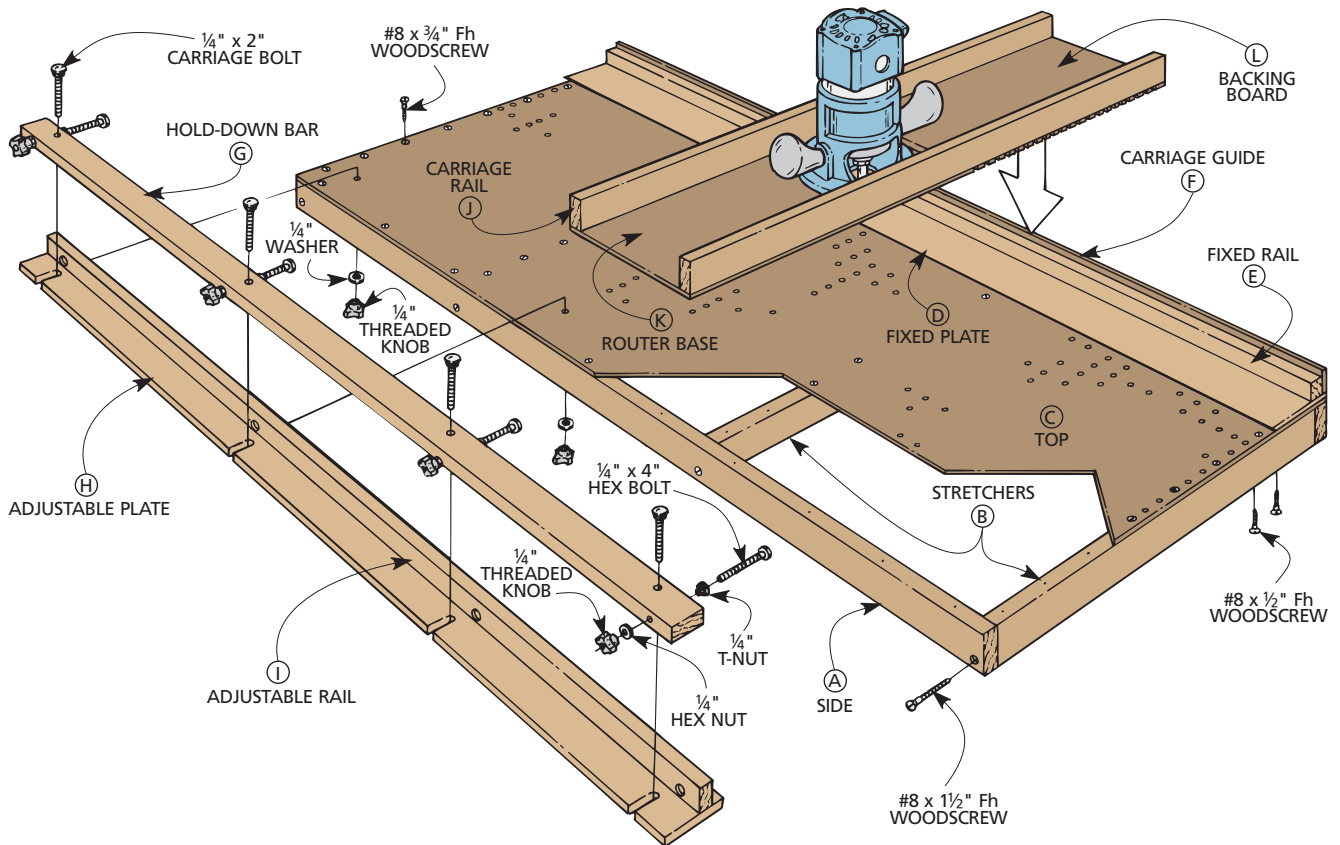
WIDE PANELS. One of the things I like most about this jig is that it can be used on glued-up panels and boards that are too wide for most thickness planers and jointers. In fact, you can work on panels over 17" wide on this jig.

THICK AND THIN. The jig is designed to handle stock up to 1" thick. And with the workpiece shimmed up, a board can be taken down to a thickness of 1/4".

EXPLODED VIEW

OVERALL DIMENSIONS:

47³/₄W x 36¹/₂D x 4¹⁵/₁₆H (WITHOUT ROUTER)



MATERIALS LIST

WOOD

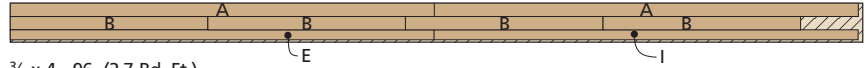
A Sides (2)	3/4 x 1 1/2 - 47 3/4
B Stretchers (4)	3/4 x 1 1/2 - 22 1/4
C Top (1)	1/4 pgbd. - 23 3/4 x 47 3/4
D Fixed Plate (1)	3/8 x 4 - 47 3/4
E Fixed Rail (1)	3/4 x 1 1/8 - 47 3/4
F Carriage Guide (1)	1/4 hdbd. - 1 5/16 x 47 3/4
G Hold-down Bar (1)	3/4 x 2 1/8 - 47 3/4
H Adjustable Plate (1)	3/8 x 4 - 47 3/4
I Adjustable Rail (1)	3/4 x 1 1/8 - 47 3/4
J Carriage Rails (2)	3/4 x 1 1/2 - 36 1/2
K Router Base (1)	1/4 hdbd. - 9 x 36 1/2
L Backing Board (1)	1/4 hdbd. - 7 1/2 x 16 1/4

HARDWARE SUPPLIES

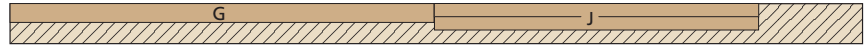
- (8) No. 8 x 1/2" Fh woodscrews
- (70) No. 8 x 3/4" Fh woodscrews
- (8) No. 8 x 1 1/2" Fh woodscrews
- (8) 1/4"-20 threaded knobs
- (4) 1/4" x 4" hex bolts
- (4) 1/4" x 2" carriage bolts
- (4) 1/4" T-nuts
- (4) 1/4" hex nuts
- (4) 1/4" flat washers

CUTTING DIAGRAM

3/4 x 4 1/2 - 96 (3 Bd. Ft.)



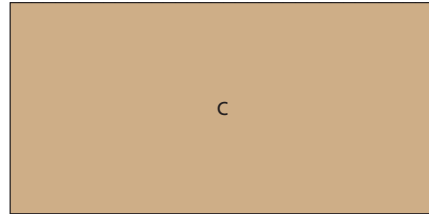
3/4 x 4 - 96 (2.7 Bd. Ft.)



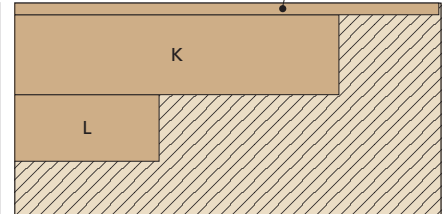
3/8 x 4 1/2 - 96 (3 Sq. Ft.)



1/4" PEGBOARD - 24 x 48



1/4" HARDBOARD - 24 x 48



PLATFORM

There are two main parts to the Planing Jig: a platform that cradles the workpiece, and a carriage that supports the router.

The platform is made up of a rectangular base with two jaws. One jaw is fixed; the other is adjustable (*Fig. 1*).

BASE. The base is just a hardwood frame consisting of two sides (A) that are drilled and screwed to four stretchers (B). (I used hard maple.)

To make it easy to position the adjustable jaw anywhere on the base, I used 1/4" pegboard for the top (C).

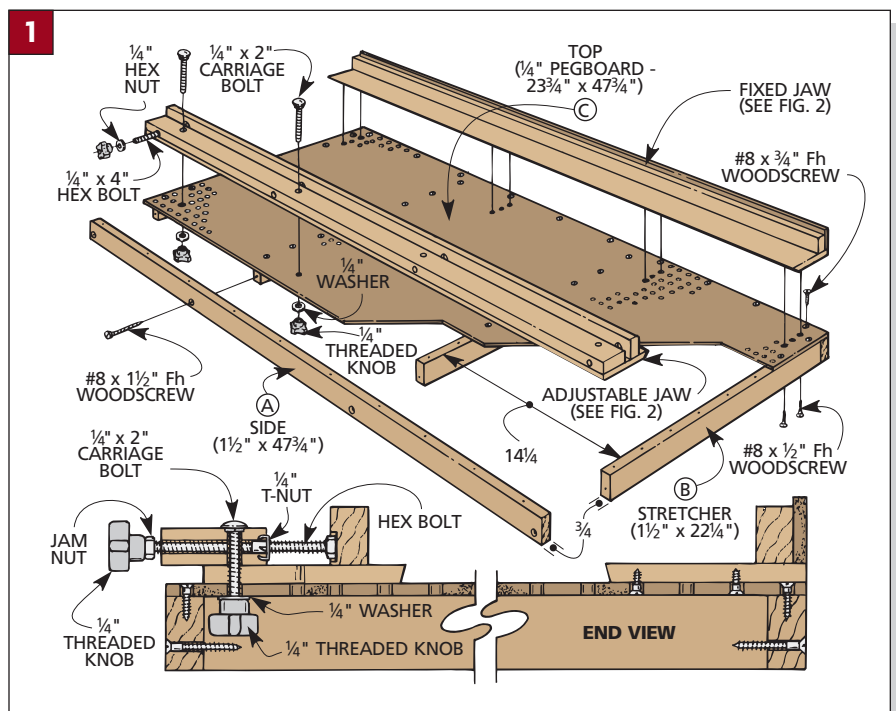
Note: Instead of drilling extra holes to screw the pegboard to the frame, cut the pegboard so the existing holes are centered over the frame pieces (*Fig. 1*).

FIXED JAW. The next step is to make the fixed jaw. It has three parts: a plate, a rail, and a carriage guide (*Fig. 2*).

The fixed plate (D) is beveled so the jaw can grip a workpiece better. The fixed rail (E) is screwed to the plate to form an L-shaped support for the carriage. And a carriage guide (F) made from 1/4" hardboard is glued to the rail.

After gluing and screwing the jaw together, mount it to the base (*Fig. 1*).

ADJUSTABLE JAW. The adjustable jaw also has three parts. But each is different. The plate on the adjustable jaw isn't screwed to the base. Instead, it's held in place by a hold-down bar (*Figs. 2 and 2b*).



This allows the adjustable jaw to move and press against the workpiece.

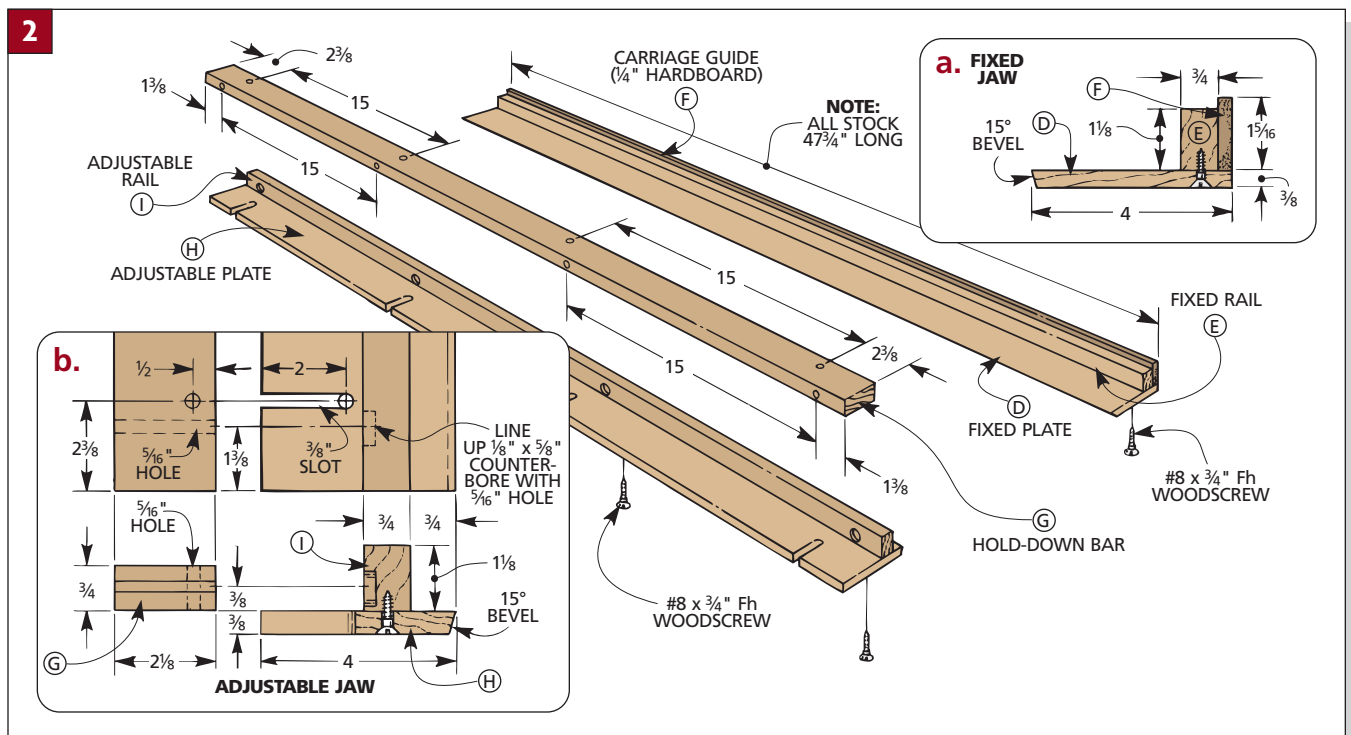
The hold-down bar (G) sits on top of the adjustable plate (H). Bolts pass down through it (and slots in the plate) into the pegboard. Plastic knobs lock the bar and plate securely to the base.

Then, to allow the plate to be adjusted, a second set of longer bolts runs horizontally through the hold-down bar and

a T-nut and presses against the back face of the adjustable rail (I) (*Fig. 1*).

Counterbores in the adjustable rail accept the heads of the bolts and keep the jaw from sliding when pressure is applied. The clamping pressure comes from threaded knobs (or wing nuts) and jam nuts threaded onto each bolt.

Once the adjustable jaw is complete, attach it to the base (*Fig. 1*).



CARRIAGE

The carriage supports the router above the workpiece as it rides across the platform. It consists of a pair of rails with a base for the router. Grooves in the bottom allow you to “index” the router over the workpiece in even increments.

RAILS. I began work on the carriage by making the rails (J) (Fig. 3). These pieces of hardwood are cut extra long so the carriage can reach across both jaws no matter where it’s indexed.

The rails are glued and screwed to a router base (K) made of 1/4" hardboard, flush with the edges of the base (Fig. 3).

Safety Note: Don’t screw into the section of the base that will be grooved later on (about 19" from the end).

BACKING BOARD. To support the grooves that are cut next, a backing board (L) is cut to fit between the rails and is glued to the top of the base (K) (Fig. 3).

After the glue dries, the index grooves can be cut. These are cut on the bottom of the base and are sized to fit the thickness of the carriage guide (Fig. 3a).

The grooves are spaced 3/4" apart for the 1"-dia. bottom-cleaning bit. (See the Shop Info box above.) This provides a 1/4" overlap on each pass.

Note: If you’re using a different diameter bit, you’ll need to adjust this spacing to allow for an overlap.

MOUNT ROUTER. After you’ve cut the grooves, cut a hole in the base for the bit and mount the router to the carriage. Then refer to the Technique box below to learn how to use the jig.

SHOP INFO .. Bottom-Cleaning Bit

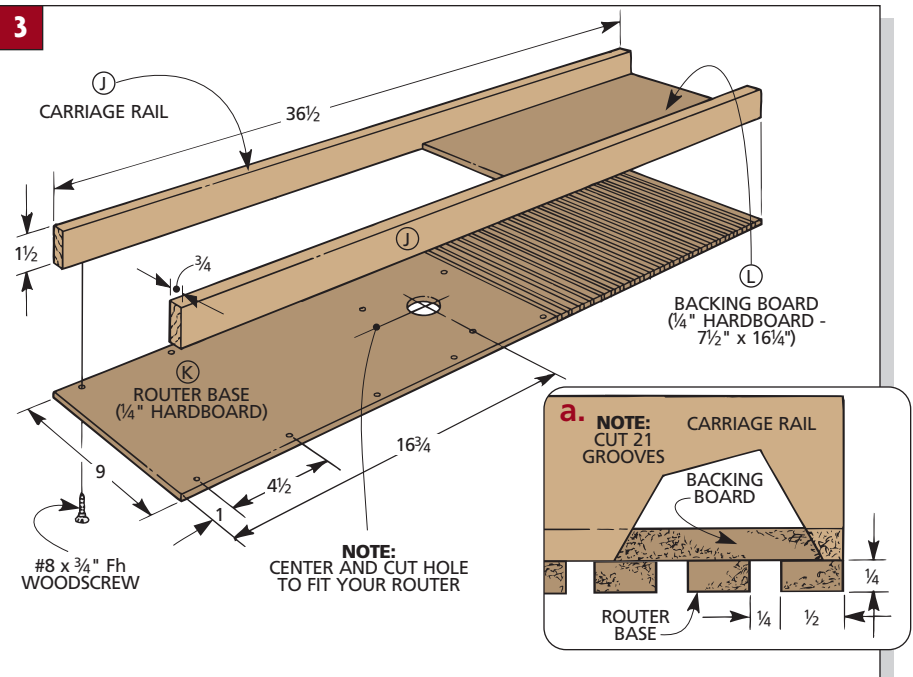
After using the Planing Jig the first couple of times, I have to admit I was disappointed with the results. The problem was with the straight bit I used. More specifically, with the points on the bottom of the cutters of the bit. They left a series of swirls on the workpiece that had to be sanded out.

With a little research, I came up with the solution — a bottom-cleaning

bit (see photo).

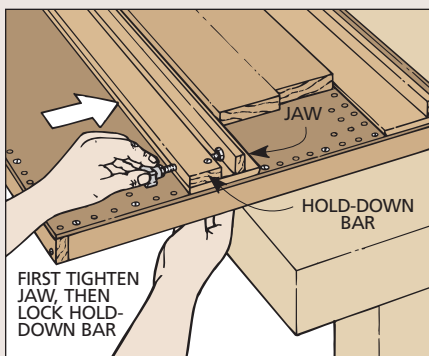
It’s similar to a straight bit, but it has an additional set of cutters on the bottom. These cutters are designed to “plane” the surface smooth and flat. What you end up with is a surface that requires very little finish sanding.

For sources of this 1"-dia., 1/2" shank bit, see page 126.

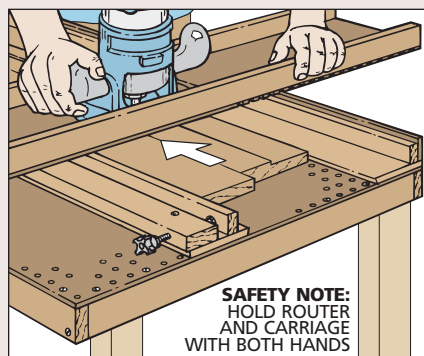


TECHNIQUE

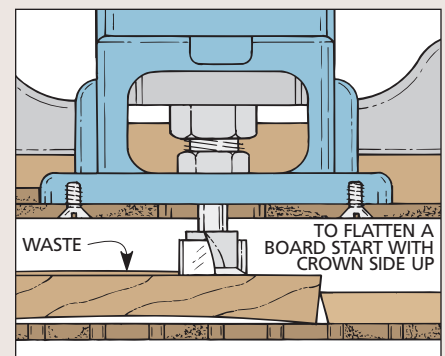
Using the Jig



Setup. To secure a workpiece in the jig, first position the adjustable jaw. Then tighten the hex bolts to move the jaw as you lock the hold-down bar.



Thickness. Place carriage on platform and rout in a left-to-right direction. Pull the carriage back to clean up the pass. Then index the router and repeat.



Flatten. To flatten a workpiece, start with the crowned side up. Once you flatten the crown, flip the workpiece over and rout the other side to bring it to thickness.

Pin Router

Just about anything you can cut in a hardboard template can be “custom-carved” into a panel using this shop-made jig. Signs, decorative reliefs, and custom-fitted cases are just a few possibilities.



Unless you've seen one in operation, your first question might be “What is a Pin Router?” The answer is that it's a great way to “carve” out decorative reliefs, custom-fitted recesses, and signs. (See the photo on page 61 for some samples.)

And when you get right down to it, a Pin Router is a very basic machine. There's a router bit that lines up with a small pin in the base of the jig. The pin helps guide a template that's attached to the bottom of the workpiece.

The problem is, most pin routers are large pieces of equipment typically found

in production shops. I was looking for a scaled-down version I could use in my own shop. So I built the Pin Router shown above. Once you have the jig built, you can carve almost anything that you can cut into a hardboard template. About all that limits you is your imagination.

BASE AND CARRIAGE. This Pin Router has two basic parts. The first is a base that supports the workpiece and template. The guide pin fits in the base directly under the router bit. As you slide the workpiece (and template) around, the pin only allows the router bit to rout a recess that matches the template.

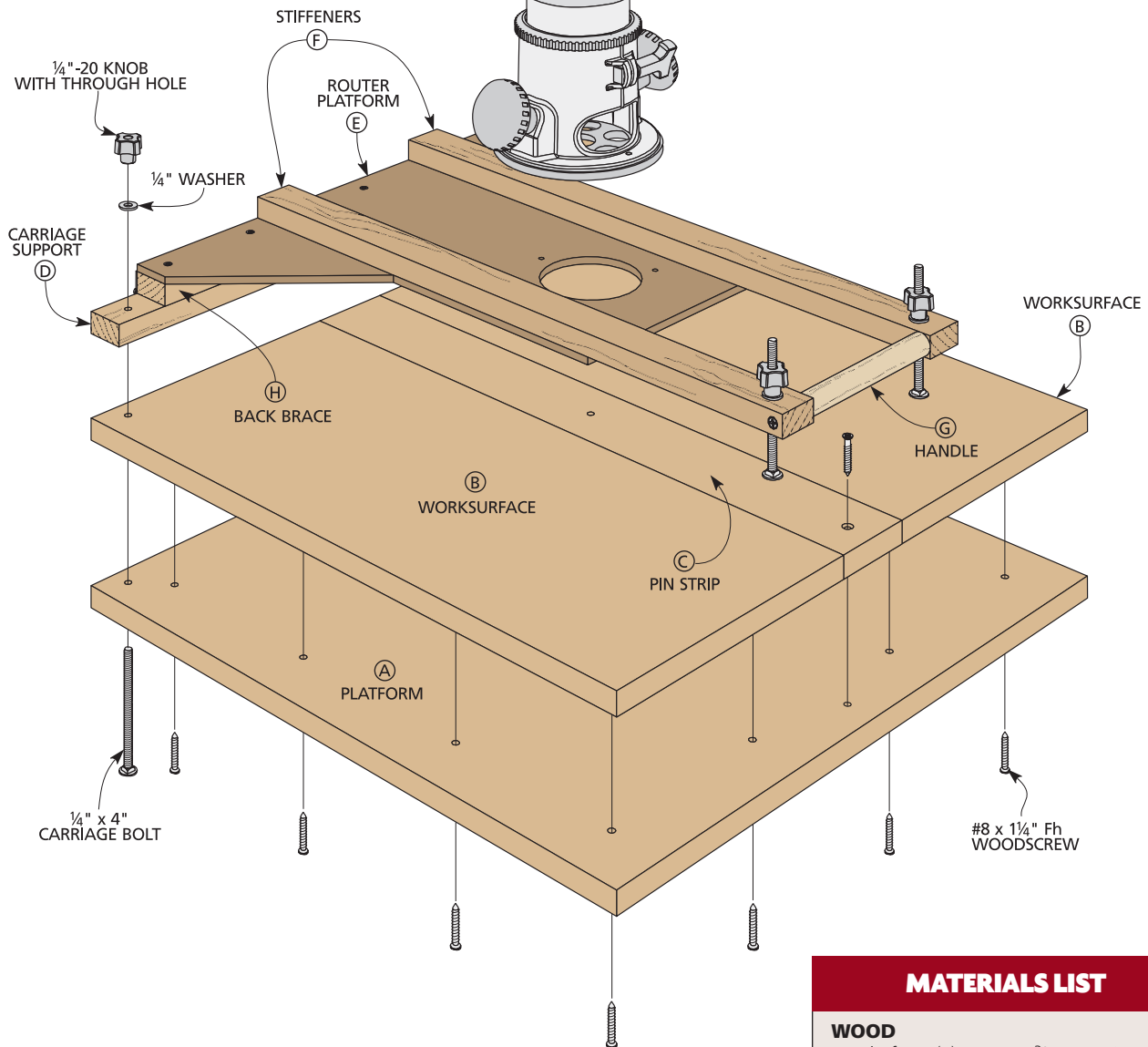
The other part of the jig is a carriage that supports the router (and bit) above the workpiece. The carriage is hinged to the base and allows you to lift the router out of the way. This makes it easy to slip the template and workpiece into place and remove it when you're done.

ACCESSORIES. There are a couple of accessories you can add to the jig. The first is a dust port for hooking up a shop vacuum or dust collector. (Pin routing can kick up a lot of chips.) And to allow you to work with thicker workpieces, a simple spacer is used to raise the carriage to the correct height.

EXPLODED VIEW

OVERALL DIMENSIONS:

24W x 24D x 5³/₄H

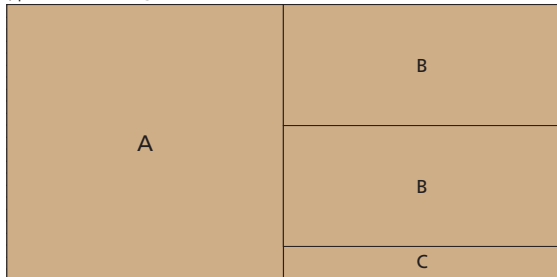


CUTTING DIAGRAM

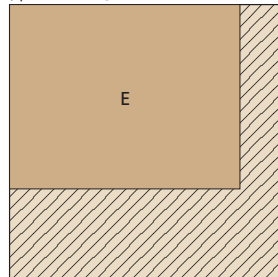
3/4 x 3 1/2 - 48 (1.2 Bd. Ft.)



3/4" MDF - 24 x 49



1/4" HARDBOARD - 24 x 24



NOTE: ALSO NEED ONE 6" PIECE OF 3/4" DOWEL FOR PART G

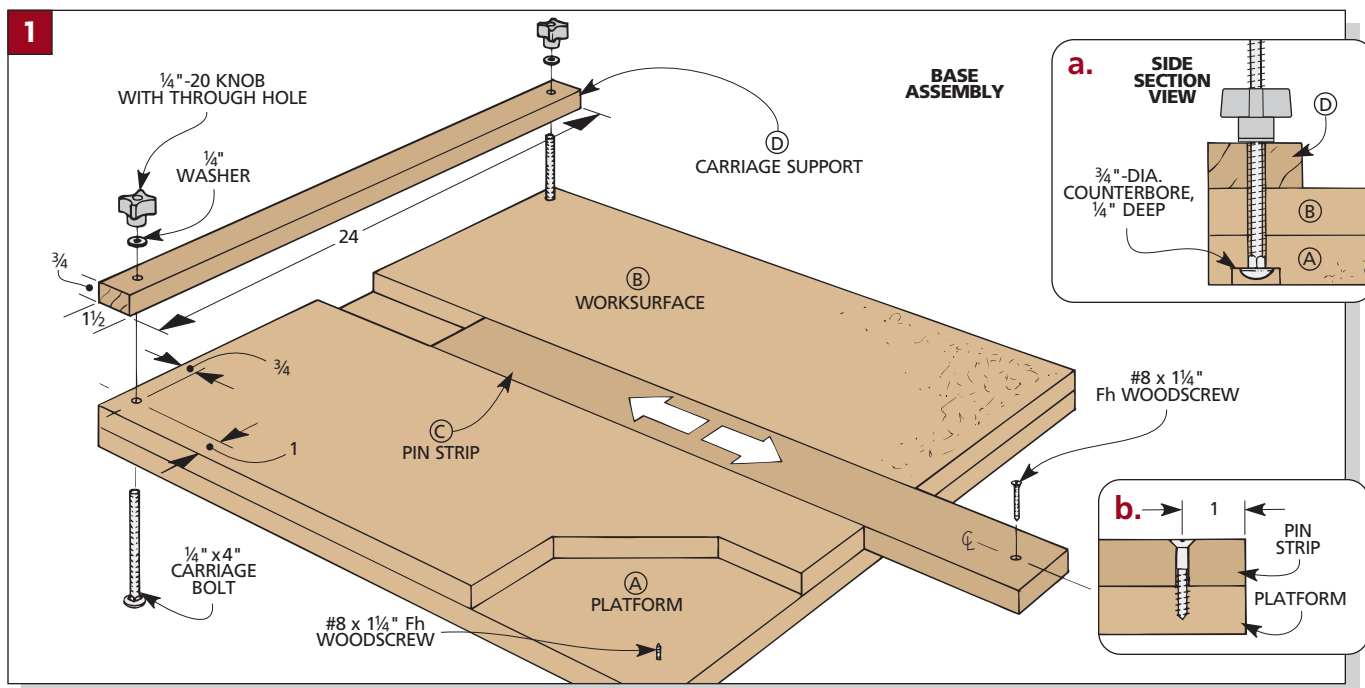
MATERIALS LIST

WOOD

- A** Platform (1) 3/4" MDF - 24 x 49
- B** Worksurfaces (2) 3/4" MDF - 10 1/2 x 24
- C** Pin Strip (1) 3/4" MDF - 3 x 24
- D** Carriage Support (1) 3/4 x 1 1/2 - 24
- E** Router Platform (1) 1/4 hdbd. - 16 x 20
- F** Stiffeners (2) 3/4 x 1 1/2 - 24
- G** Handle (1) 3/4" dowel x 6
- H** Back Brace (1) 3/4 x 1 1/2 - 20

HARDWARE SUPPLIES

- (20) No. 6 x 5/8" Fh woodscrews
- (15) No. 6 x 5/8" Fh sheet-metal screws
- (17) No. 8 x 1 1/4" Fh woodscrews
- (2) No. 8 x 2 1/2" Fh woodscrews
- (4) 1/4"-20 knobs w/ through hole
- (4) 1/4" x 4" carriage bolts
- (2) 1/4" nuts
- (6) 1/4" washers
- (1) 1 1/2" x 20" piano hinge



BASE

I started on the Pin Router by building a base that consists of four pieces of MDF: a square platform, two rectangular worksurfaces, and a narrow pin strip that holds the guide pin (*Fig. 1*).

BASE AND WORKSURFACES. Making the platform (A) and worksurfaces (B) isn't difficult. It's just a matter of cutting the pieces to size (*Fig. 2*). The hardest part is gluing them together. That's because they want to slide out of position as you glue them in place.

PIN STRIP. To keep things in position, I used the pin strip as a stop to align the worksurfaces. After cutting the pin strip (C) to size, I centered it on the platform so it was flush at the front and back, and then clamped the strip in place (*Fig. 2*).

At this point, you could just glue the worksurfaces in place. But if you want to avoid using a lot of clamps (or you're short a few), it's a simple matter to drill a few pilot holes through the bottom of the platform into each worksurface.

After you add the glue, you can screw the worksurfaces and platform together.

The screws hold everything in place while the glue dries. To avoid getting glue on the pin strip, go easy when you apply glue near the edge of the strip. And just to make sure the strip wasn't glued in place, I removed it once the worksurfaces were screwed down.

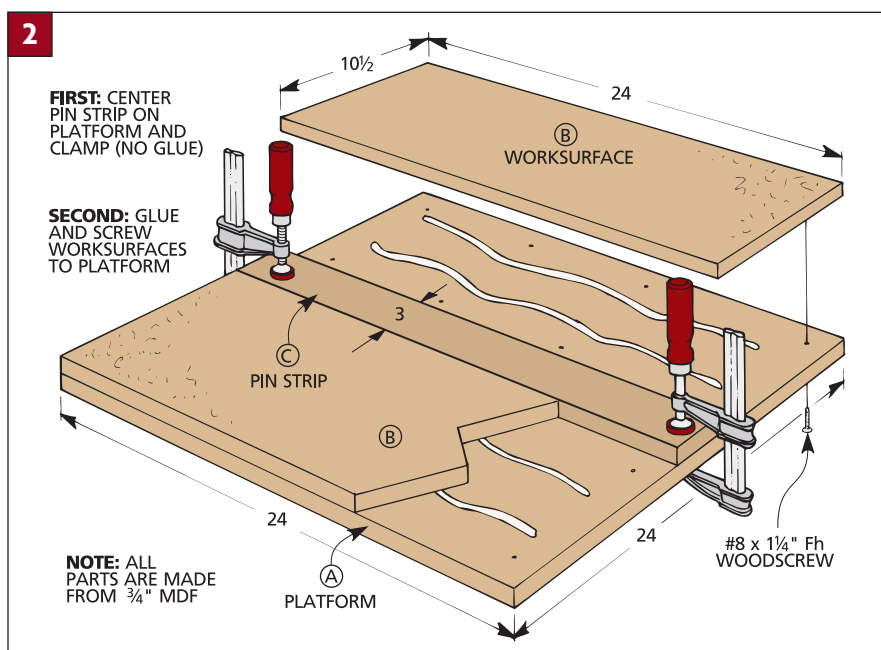
Later, when the jig is in use, it's important that the pin strip is locked securely in the channel. So once the glue dries, slide the strip back in the channel and drill a $3/32$ "-dia. pilot hole near the front edge. The hole accepts a screw that "locks" the strip in place (*Fig. 1b*).

CARRIAGE SUPPORT. At this point, there's one more thing to add to the base. And that's a carriage support (*Fig. 1*). The support accomplishes two things. First, it raises the router carriage off the worksurface, providing room for the workpiece and template. And second, it provides a place for mounting the router carriage to the base.

The carriage support (D) is just a $1\frac{1}{2}$ "-wide strip of hardwood cut to match the width of the base. It's attached with a pair of carriage bolts and knobs (*Fig. 1a*). To allow the base to rest flat on a workbench, the head of the carriage bolt fits in a counterbore in the bottom of the base.

CARRIAGE

At the center of the Pin Router is the carriage. It's just a Y-shaped platform that positions the router above the base. To make it easy to slip the workpiece and



template over the guide pin, there's a hinge at the back of the carriage that lets you lift the router up out of the way.

ROUTER PLATFORM. The router platform is Y-shaped for two reasons. It's wide at the back to provide support for attaching the carriage to the base. And it's narrow at the front to make it easy to move the workpiece below the router.

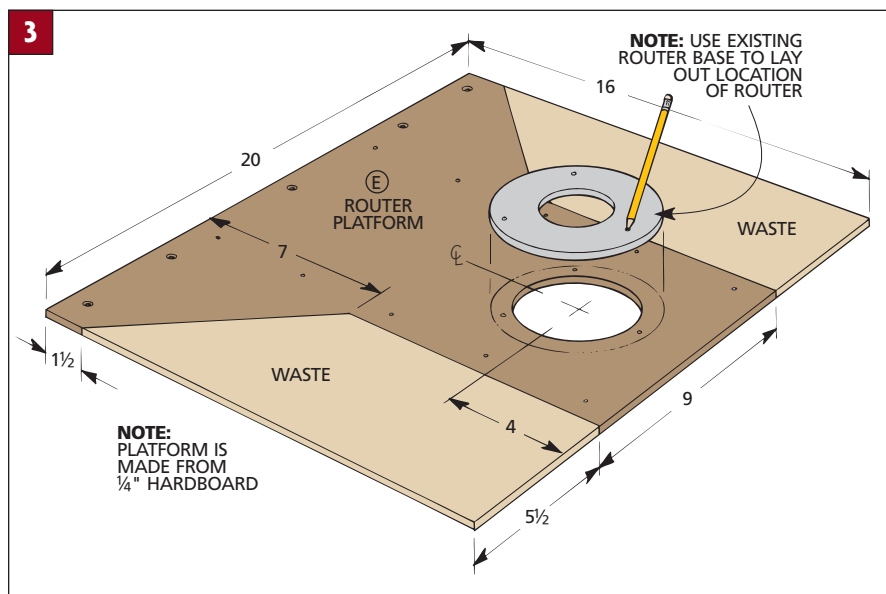
The important thing here is to size the narrow part of the router platform to fit the base of your router. It's sized so it's $3\frac{1}{2}$ " wider than the base of the router. (In my case, this was 9".)

This extra width provides room for a pair of stiffeners (added later) and clearance for the router. After laying out the router platform (E) on a piece of $\frac{1}{4}$ " hardboard, you can cut it to size (Fig. 3).

At this point, you're ready to locate the router and drill a clearance hole. The easy part about doing this is the base of the router is a ready-made template for marking and drilling the holes. Then to make it easy to see the workpiece, I cut a large clearance hole in the platform.

STIFFENERS. With the platform cut to shape, the next step is to add a pair of stiffeners (Fig. 4). The stiffeners prevent the platform from sagging under the weight of the router. They also provide a convenient place to add a handle.

The stiffeners (F) are narrow ($1\frac{1}{2}$ ") strips of $\frac{3}{4}$ " hardwood. They're cut to length (24") to match the depth of the base and they're attached to the router platform with glue and screws.



HANDLE. The handle (G) is just a short length of dowel that's cut to fit between the stiffeners. To hold it in place, there's a screw that passes through the stiffener into a pilot hole pre-drilled in each end of the dowel (Fig. 4b).

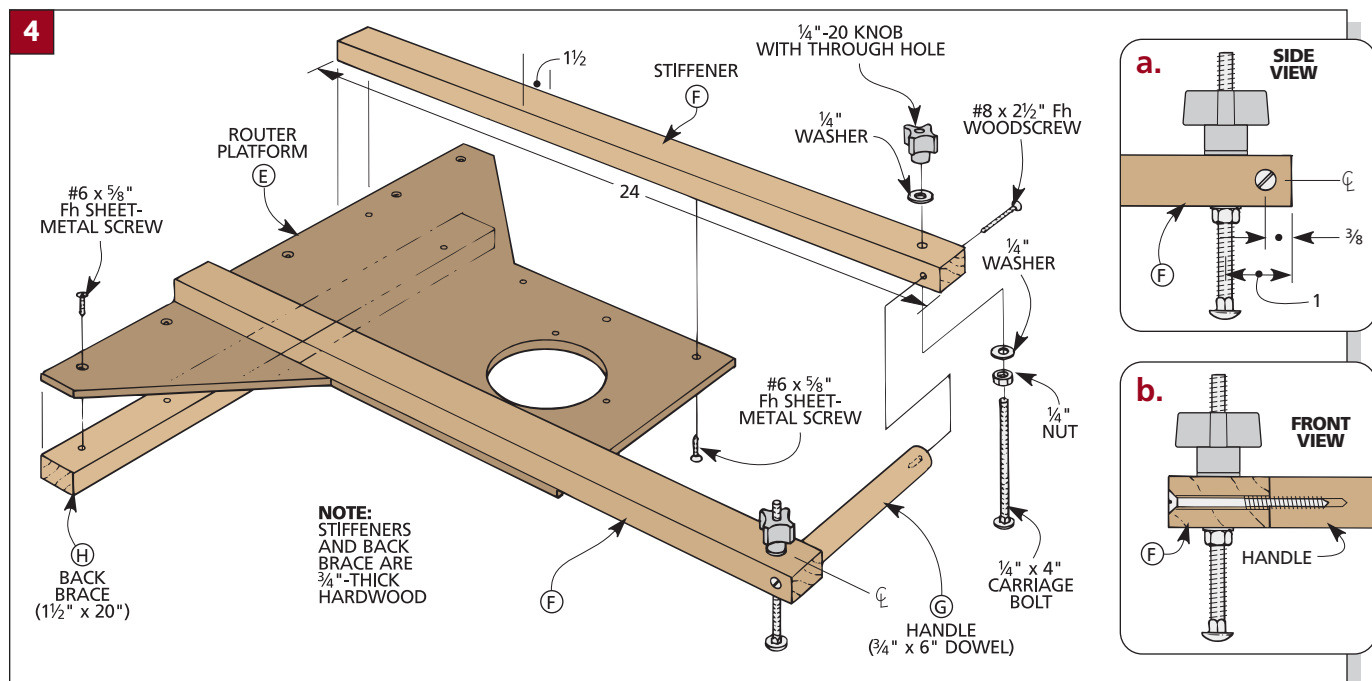
At this point, the basic structure of the carriage is complete, but there are still a couple of things to do before you can attach it to the base. First, you'll need a solid mounting point for attaching the carriage. And then, once it's attached, you'll need a way to keep the carriage parallel to the platform as you work.

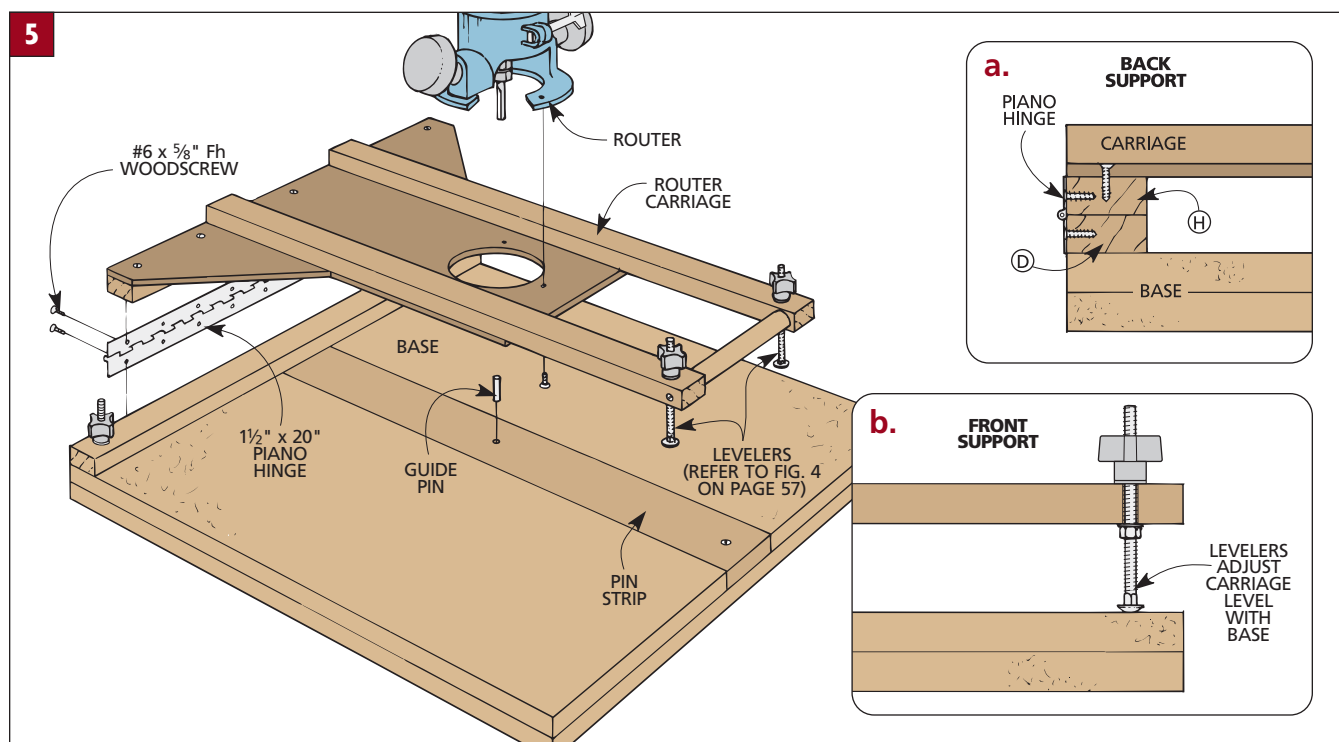
BACK BRACE. To provide a sturdy mounting surface for the hinge that

attaches the carriage to the base, I added a back brace. Like the stiffeners, the back brace (H) is made from a narrow strip of $\frac{3}{4}$ "-thick hardwood (Fig. 4).

The brace is cut to width ($1\frac{1}{2}$ ") to match the carriage support. It's the same length as the back edge of the router platform (20"). After cutting the brace to size, I glued and screwed it to the bottom of the router platform.

There's one last thing to do before attaching the carriage to the base. It's a good idea to drill a $\frac{1}{4}$ "-dia. hole at the end of each stiffener to accept the carriage leveling system that will be added shortly (Figs. 4 and 4a).





ASSEMBLY

Once the holes for the levelers are drilled, the two main assemblies for the jig are complete, so you can mount the carriage to the base. It's held in place with a long piano hinge that's attached to the back brace and carriage support (*Fig. 5a*).

Start by screwing one leaf of the hinge to the back brace. Then set the carriage in place so it's centered on the width of the base. Finally, clamp the two assemblies

together to keep them aligned while you drill pilot holes and drive the screws into the carriage support.

LEVELERS. Now you're ready to add the shop-made levelers. As their name implies, they keep the carriage level to ensure that the router bit remains perpendicular to the workpiece (and the template) as you work (*Fig. 5b*).

The levelers are just 4"-long carriage bolts. After threading a nut and washer halfway down a bolt, slip the assembly

through a stiffener. Then add a second washer and a knob to hold everything in place. (Refer to *Fig. 4* on page 57.)

LOCATE GUIDE PINS. All that remains to complete the jig is to locate the guide pin in the pin strip. To ensure that it was positioned accurately, I used the router and a straight bit to locate the hole.

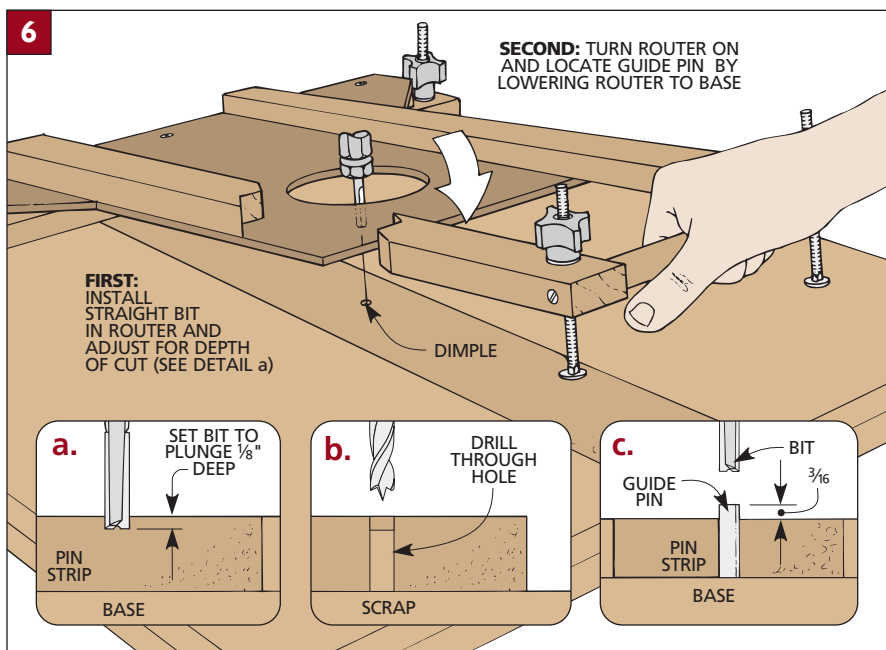
After mounting the router to the carriage, adjust the levelers so the carriage is parallel to the base (*Fig. 5b*). To do this, loosen the knob on the top of the stiffener. Then turn the nut on the bottom of the stiffener until the carriage is parallel to the base. Once that's complete, a twist of the knob will lock the levelers in place.

Now install a straight bit in the router. (I used a ¼" bit.) Then adjust the cutting depth so that when the carriage is lowered to the base, the router bit will make a ⅛"-deep cut (*Fig. 6a*).

At this point, raise the carriage so the bit clears the base and turn the router on. Then lower the carriage back to the base to create a small "dimple" in the exact location for the pin. Now it's just a matter of using the dimple as a guide for drilling the hole in the pin strip (*Fig. 6b*).

Note: Remove the pin strip from the jig before drilling the hole.

ADD GUIDE PINS. Once the strip has been drilled to accept the guide pin, all you need to do is make the pin and install it. I found it easiest to cut the guide pin from a short length of metal rod that



ACCESSORIES Pin Router

When you get right down to it, the Pin Router is a rather simple device. And the addition of a couple of simple accessories can make the jig more versatile and easier to use.

First is a dust collector to keep chips off your work. It makes it much easier to see your progress as you rout. And if you work with stock thicker than $\frac{3}{4}$ ", you'll need to add a simple spacer to the jig to keep the router level.



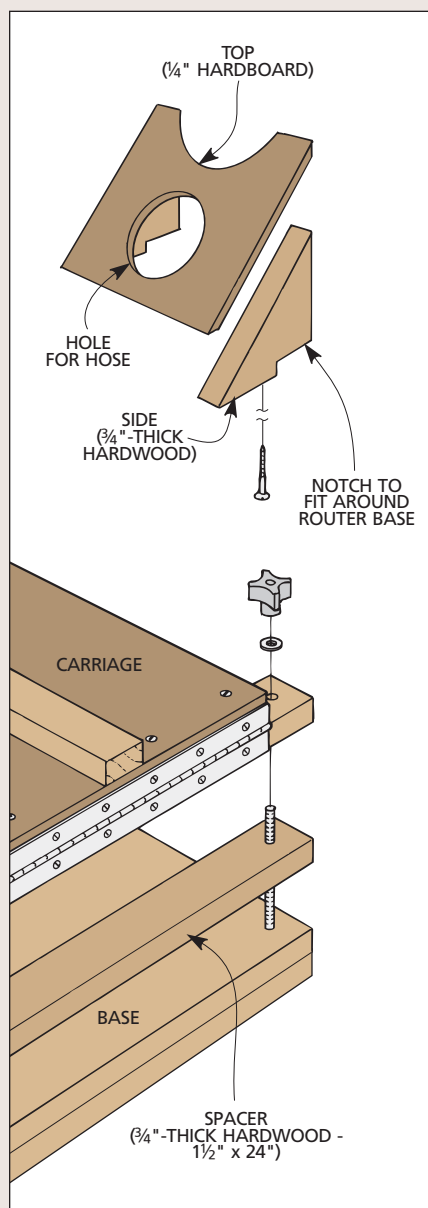
DUST COLLECTOR

Once you start using the jig, it doesn't take long before chips and dust begin to cover things up and make it hard to see what you're doing. To clean things up (and keep the dust out of my face), I added a dust collector to the back of the router carriage (see photo above).

Although each model of router is different, an assembly like the one shown in the drawing (along with a shop vacuum) can be adapted to most routers to collect the majority of the dust and chips.

The collector couldn't be much simpler. It's just a couple of triangular-shaped, $\frac{3}{4}$ "-thick hardwood sides connected by a $\frac{1}{4}$ " hardboard top (see drawing). A circular notch cut in the top edge provides a custom fit around the body of the router.

To get a good fit between the hardboard top and the router, it's a good idea to make a template out of thin cardboard first. Once you have a good fit between



the template and the body of the router, use the template to lay out the shape on the hardboard. The side pieces may also need some "fine-tuning" to fit around the base of the router. I notched the sides to

fit around the base, then sanded and filed to make clearance around the body.

After drilling a hole in the top to accept the hose from the dust collector (or shop vacuum), I glued the sides in place. Once the glue dried, I attached the collector to the carriage with screws.

Note: If the dust collector hose doesn't fit snugly in the hole, just wrap some duct tape around the nozzle.



SPACER

As built, the Pin Router is designed to accommodate a $\frac{1}{4}$ "-thick template and a workpiece up to $1\frac{1}{8}$ " thick. But there are times when you may want to use a thicker workpiece (like the sign being made from "two-by" stock shown in the photo above). To allow for that, all you need to do is add a spacer to lift the router carriage.

SPACER. There's nothing difficult about making the spacer. It's just a $\frac{3}{4}$ "-thick piece of hardwood identical in width and length to the carriage support (see drawing). (If you need a thicker spacer, you may need to use longer bolts in the levelers.) After cutting the spacer to size, drill a hole at each end to slip over the carriage bolts in the jig. I used the holes in the carriage support as a drilling guide.

ADJUST LEVELERS. The spacer fits between the carriage support and the base of the jig. Once the spacer is in place, you'll need to readjust the levelers to account for the extra thickness.

matched the diameter of my router bit. The shank of a bolt would also work. (See the Shop Tip on page 61.)

The key thing to remember is that once the pin is installed, you don't want it sticking up higher than the thickness of the template. Since I used $\frac{1}{4}$ "-thick hardboard, I cut my pin so it was $\frac{3}{16}$ " above the pin strip (Fig. 6c).

After filing the burrs off the end of the pin, it can be installed in the pin strip. To do this, just dab a little epoxy in the strip and tap the pin in place.

Note: Depending on the pattern to be routed, you may want to use a different size bit. (A larger bit is good for removing waste quickly, while a smaller bit allows you to reach into tighter areas.)

So you'll need a new pin strip with a guide pin to match the bit. To make additional strips, just repeat this process for each different size guide pin.

The jig is ready to use at this point. But you may want to consider adding the accessories shown above. And to learn how to use the jig, see the Technique article on the next page. ■

TECHNIQUE Using the Jig

Once the Pin Router is complete, you're ready to put it to use. The projects you can make with it are limited only by what will fit in the jig and your imagination.

TEMPLATE. As mentioned earlier, the guide pin works with a template fastened to the bottom of the workpiece. The template has cutouts in it. Since the guide pin is the same diameter as the bit and aligns with it, whatever the guide pin traces in the template, the bit cuts in the workpiece (see drawing). And to make a template, you'll need a pattern.

PATTERN. The pattern can be almost anything you like. You can use the Pin Router to make relief carvings, a custom-fitted tray for a fine tool or other collectibles, or signs. (See the photo on the opposite page.) To make a pattern, you can draw it out by hand, design it on a computer, or photocopy it.

Once you have the pattern completed, attach it to an oversized piece of 1/4" hardboard (left photo below). The ends of an

oversize template provide a convenient grip for maneuvering the template and workpiece as you work.

Note: The workpiece can be smaller than the template.

CUT OUT TEMPLATE. Once the pattern is attached to the hardboard, the next step is to remove the waste using a scroll saw or jig saw (right photo below). It's best to stay to the waste side of the line, then use files and sandpaper to remove any rough edges. What you're looking for here is to create smooth edges for the guide pin to follow. Any imperfections in the template

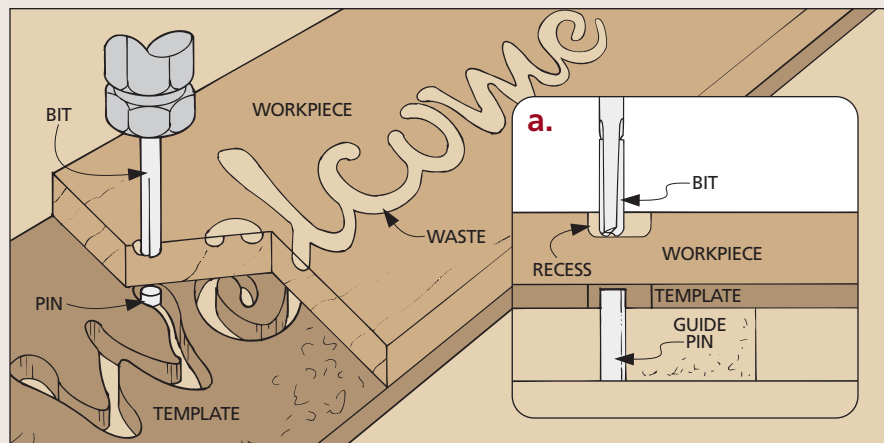
will be duplicated in the workpiece. So it pays to spend time making sure the template is just right.

With the template in hand, you might be ready to attach it to the bottom of the workpiece and start working. But I found it easier to start by tracing the outline of the template on the top of the workpiece first (*Step 1*). This makes it easy to keep track of exactly where you're working and to see the wider places of the pattern that still need to be routed.

Next, attach the template to the bottom of the workpiece with screws or carpet tape (*Step 2*). Just remember to position it so it matches the tracing you made on the top of the workpiece.

To adjust the router bit for depth of cut, slide the template and workpiece against the guide pin for reference (*Step 3*).

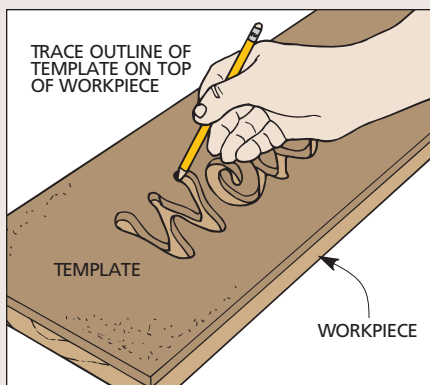
Note: Rout only 1/4" or less per pass.



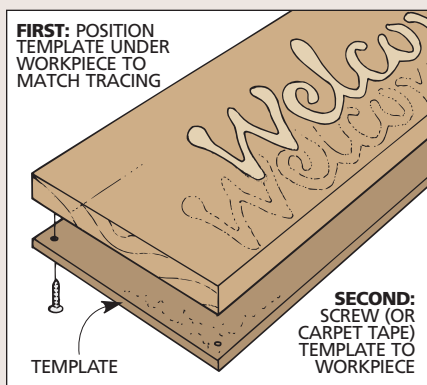
Create Pattern. A pattern can be created by drawing one free-hand, by using a computer, or by making a photocopy. Once you have the pattern, use a spray adhesive to temporarily attach it to an oversized hardboard template.



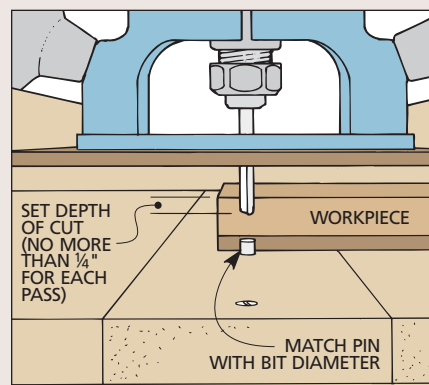
Cut Out Template. Using a scroll saw (or jig saw), remove the waste from the template. Stay to the waste side of the lines so you can use sandpaper and a file to smooth the inside surfaces. Any imperfections will be transferred to your finished piece.



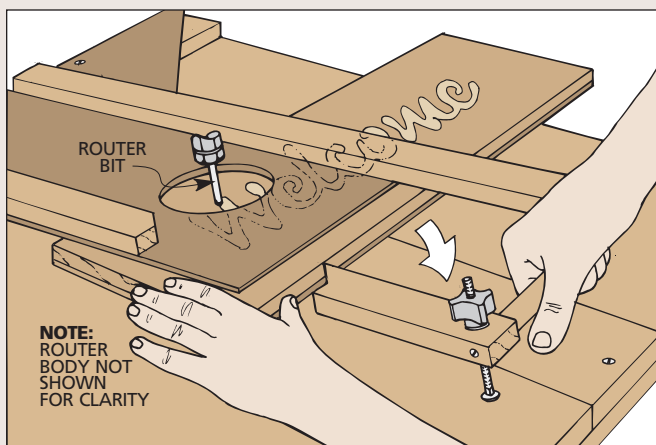
1 Before attaching the template to the workpiece, trace the outline on the top of the workpiece for reference.



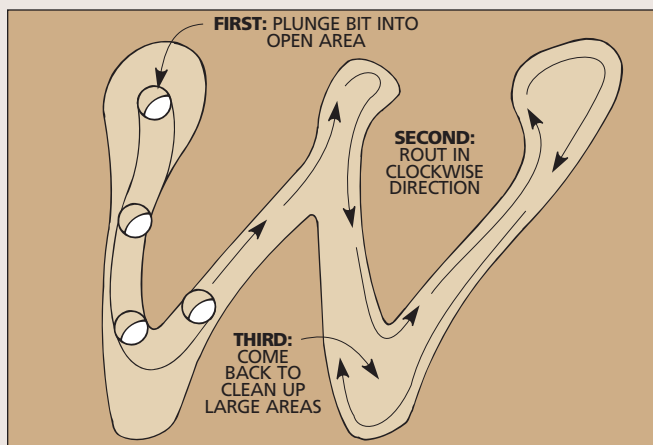
2 Then screw (or carpet tape) the template to the bottom of the workpiece. **Note:** Workpiece shown is extra long.



3 Adjust the cutting depth of the bit by lowering the carriage and using the workpiece and template as a reference.



4 After setting the workpiece and template over the pin, turn the router on and lower the bit into the workpiece. Then rout in a clockwise direction (see Step 5).



5 For best results, start the cut away from the edge. Run the pin against the template, moving in a clockwise direction around the pattern. Clean up larger areas of waste with more passes.

ROUTING. At this point, you are ready to begin routing. So raise the carriage and place the template and workpiece

over the guide pin. With the carriage still raised, turn the router on, then lower the carriage until the levelers make contact with the base (Step 4). Now slide the template so you rout clockwise around the perimeter of the cutout in the template (Step 5). (Routing in a clockwise direction will reduce chipout.)

Finally, clean up any waste in the center of the template with multiple passes. If there are areas of the template that aren't connected, just raise the carriage (and turn off the router), set the next area of the template over the guide pin, and continue routing.



Use Your Imagination. The Pin Router can be used to make relief carvings (top), a custom-fitted tray to hold a fine tool (middle), or signs (bottom) among other things.

SHOP TIP

Guide Pins



Routing finer details and tighter corners requires a smaller-diameter router bit — and a guide pin to match it.

For a guide pin, just cut a length of metal rod that matches the diameter of the router bit. A set of pins with 1/8", 1/4", and 1/2" diameters should handle most jobs.

Router Table

You can't buy a Router Table this good. But you can build one. It has everything you need — a large stable top, a sturdy base with plenty of storage, and an adjustable fence. And the top half is portable.



Out in the workshop, everyone is calling this Router Table my “Dr. Jekyll and Mr. Hyde” project. Not because it’s a monster, mind you. But because it has a “dual” personality. At first glance, it looks like a fairly ordinary, floor-standing Router Table. But walk over to it, lift up the top section, and all of a sudden you have a smaller, portable Router Table that’s ready to go anywhere.

Even though it’s made to be portable, this isn’t a lightweight Router Table. It has a full-size top and just about all the features you could want. To top it off, I’ve included a shop-built fence which is fully adjustable and includes a bit guard, a featherboard, and a dust collection port. For more on how to build these accessories, see page 73.

PORTABILITY. The base has an interesting two-piece design that allows you to simply lift off the upper section and carry the router table to your job site.

If you look closely, you can see that it’s actually made up of two parts — a small cabinet that the tabletop is attached to and a stand. The upper cabinet has a compartment that allows you to gain access to the router. The lower section has a tall drawer and a storage area with doors.

DUAL TRACK. The tabletop’s miter gauge slot includes a T-track for attaching featherboards. The hardware is actually two separate aluminum extrusions that form a slot for the miter gauge. This “dual track” and the T-track for the fence are each available from *Woodsmith Project Supplies*. To find all the Router Table hardware, see Sources on page 126.

DESIGN OPTIONS. Two simple design changes make the base unit even more versatile. First, to make the base easy to roll out of the way, I added a set of swivel casters. And because the top of the base is just a little low for some of my portable power tools, I made a plywood box extension. (To learn more, see the Designer’s Notebooks on pages 69 and 74.)

MATERIALS LIST

WOOD

A Top Panel (1)	3/4 ply - 21 1/2 x 28 1/2
B Top Skins (2)	1/4 hdbd. - 21 1/2 x 28 1/2
C Fr./Back Edg. (2)	3/4 x 1 1/4 - 30
D Side Edging (2)	3/4 x 1 1/4 - 23
E Fr./Bk. Cleats (2)	1/2 x 1 - 8
F Side Cleats (2)	1/2 x 1 - 6
G Cabinet Sides (2)	3/4 ply - 17 3/4 x 14
H Cabinet Back (1)	3/4 ply - 20 x 14
I Cabinet Btm. (1)	3/4 ply - 17 1/4 x 20
J Edging	3/4 x 1/4 - 384 in. in.
K Upr. Door Pnl. (2)	3/4 ply - 9 9/32 x 12 5/8
L Stand Sides (2)	3/4 ply - 17 7/8 x 22 1/4
M Dividers (3)	3/4 ply - 17 3/8 x 20 1/8
N Stand Back (1)	3/4 ply - 20 1/8 x 22 1/4
O Toe Kick (1)	3/4 ply - 19 5/8 x 3 1/4
P Front Spacers (2)	3/4 x 2 1/4 - 4
Q Back Spacers (2)	3/4 x 3 - 4
R Door Spacers (2)	3/4 x 2 1/4 - 12 3/4
S Toe Kick Spcrs. (2)	3/4 x 2 1/4 - 3 1/4
T Drawer Fr./Bk. (2)	1/2 x 3 1/2 - 16 5/8
U Drawer Sides (2)	1/2 x 3 1/2 - 16
V Drawer Bottom (1)	1/4 hdbd. - 15 7/16 x 16 9/16
W False Front (1)	3/4 ply - 17 1/2 x 3 3/8
X Lwr. Door Pnl. (2)	3/4 ply - 8 19/32 x 12 1/8

HARDWARE SUPPLIES

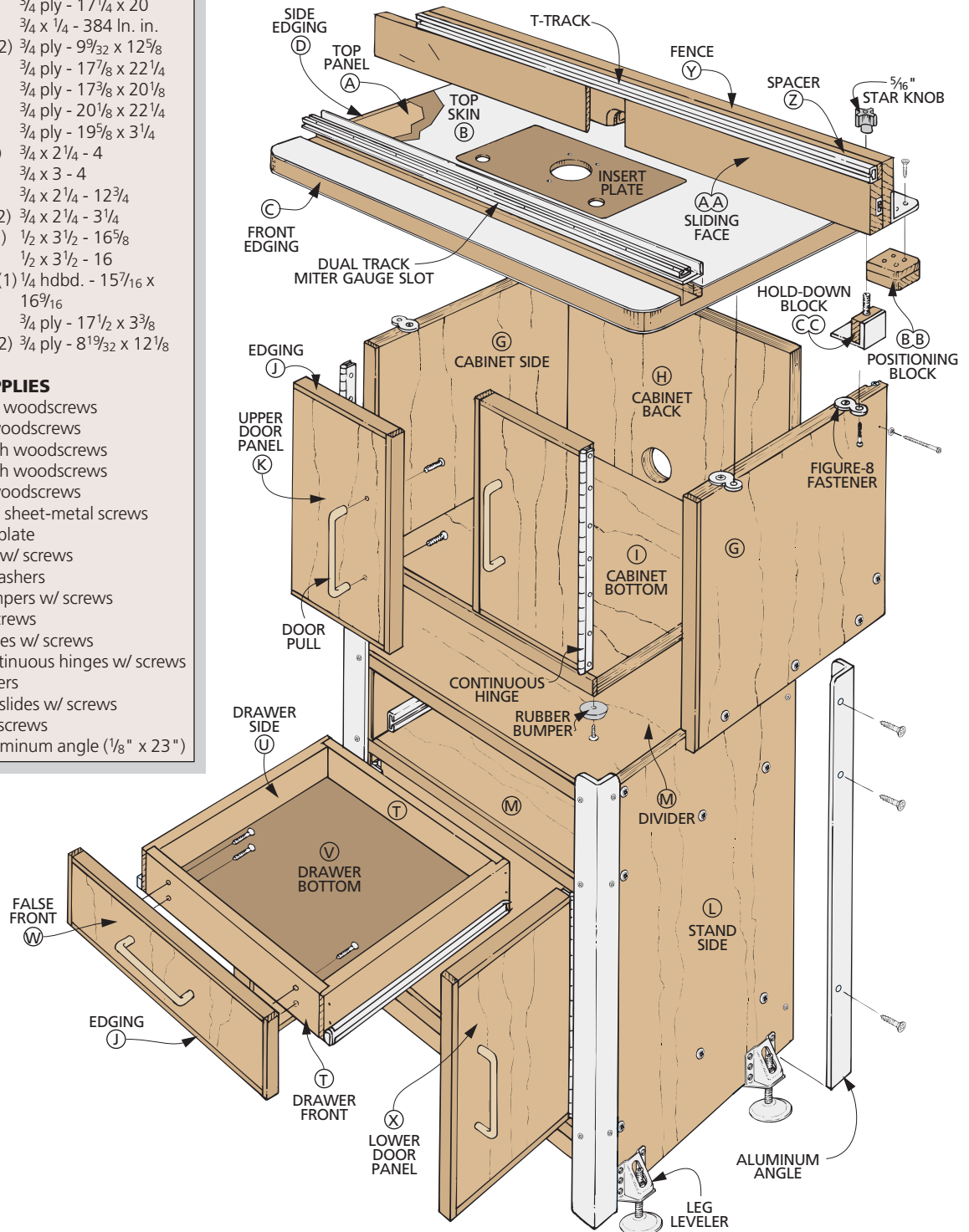
- (24) No. 6 x 3/4" Fh woodscrews
- (4) No. 6 x 1" Fh woodscrews
- (16) No. 6 x 1 1/4" Fh woodscrews
- (48) No. 6 x 1 3/4" Fh woodscrews
- (8) No. 8 x 1" Fh woodscrews
- (24) No. 8 x 5/8" Ph sheet-metal screws
- (1) Phenolic insert plate
- (1) 32" Dual Track w/ screws
- (40) No. 6 finish washers
- (4) 3/4" rubber bumpers w/ screws
- (5) 4 1/2" pulls w/ screws
- (4) Magnetic catches w/ screws
- (2) 1 1/2" x 30" continuous hinges w/ screws
- (4) Figure-8 fasteners
- (1 pr.) 16" drawer slides w/ screws
- (4) Leg levelers w/ screws
- (4) 1 1/2" x 1 1/2" aluminum angle (1/8" x 23")

EXPLODED VIEW

OVERALL DIMENSIONS:

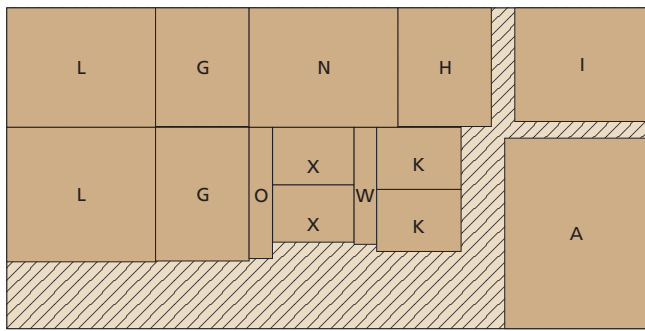
30W x 23D x 37 15/16H

NOTE: SEE PAGE 70
FOR FENCE MATERIALS LIST

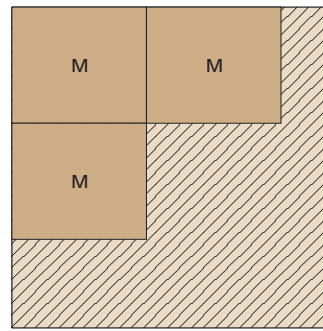


CUTTING DIAGRAM

$\frac{3}{4}$ " MAPLE PLYWOOD - 48 x 96

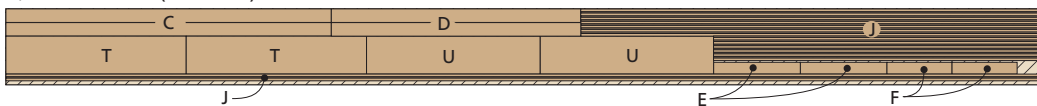


$\frac{3}{4}$ " MAPLE PLYWOOD - 48 x 48



NOTE: ALSO NEED ONE 48" x 48" SHEET OF $\frac{1}{4}$ " TEMPERED HARDBOARD FOR PARTS B AND V, AND TWO PIECES OF PLASTIC LAMINATE (24" x 32")

$\frac{3}{4}$ x 7 - 96 MAPLE (4.7 Bd. Ft.)



TOP

Since all the work will be taking place on the top, I put a lot of extra thought into the design of this part of the Router Table.

First and foremost, I wanted it to stay flat for as long as I own the Router Table. One of the best ways to ensure that the top is flat is to build it out of several layers using materials like plywood and hardboard that are less likely to warp. Then I wrapped the top with hardwood edging and covered both sides with plastic laminate to keep it flat.

FLAT TOP. To make the tabletop, start by cutting the plywood top panel (A) to finished size (Fig. 1). Then cut the two oversized hardboard top skins (B). (I made my hardboard skins about 1" wider and longer than the plywood top panel.) This way, after these hardboard skins are glued to the plywood with contact adhesive and allowed to fully set up, they are trimmed flush with a router and flush trim bit (Fig. 1a).

Start by brushing the adhesive onto both surfaces that you're joining. After the first coat dries, apply a second coat and let it dry also. (It will look glossy and won't transfer to your finger when dry.)

Since contact adhesive grips on "contact," you want to avoid letting the hardboard touch the tabletop before it's positioned. To do this, lay dowels across the top and center the hardboard over it.

Then, starting at one end, remove the dowels one at a time and roll the hardboard down as you go. The trick is to use as much pressure as possible to ensure a good bond, especially around the edges.

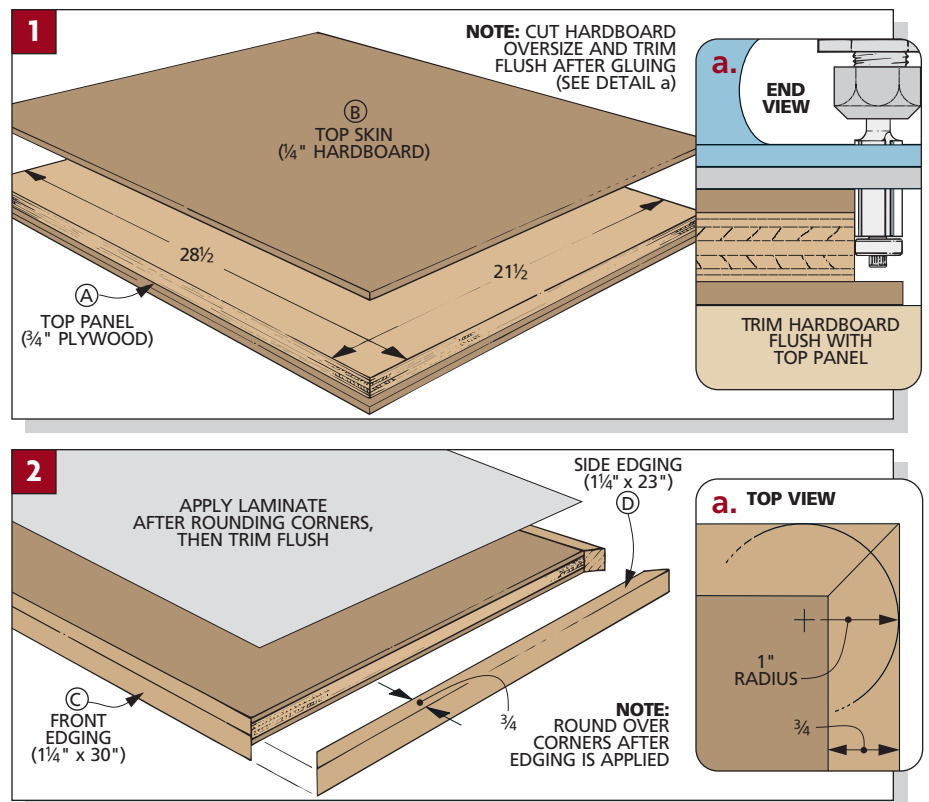
EDGING. Next, I added some hardwood edging to the top. The edging not only

covers the exposed plywood and hardboard edges, it also protects them from nicks and dings they're bound to receive.

The edging (C, D) is just four pieces of hardwood that are mitered and glued around the edges of the top (Fig. 2). I made the edging slightly wider than the thickness of the top. Then, after it was glued in place, I planed it down flush with the surfaces of the top using a hand plane. (You could also sand the edging flush.) With the edging applied, I marked the corners for a 1" radius and then rounded the corners with a belt sander (Fig. 2a).

LAMINATE. Next, I added the plastic laminate to both faces of the top. It's applied to both faces for a reason — to keep the moisture level the same on both faces, preventing the top from warping.

There's not much to adding the plastic laminate (Fig. 2). It's just a matter of gluing the laminate down with contact adhesive. (Since the laminate is more flexible than the hardboard used for the top, I used more dowels to keep it above the tabletop until it was positioned properly.) Then I trimmed the edges of the laminate with a flush trim bit.



There are two things to be concerned with when creating the opening for an insert plate: the plate should fit the opening like a glove *and* it has to be flush with the top of the Router Table.

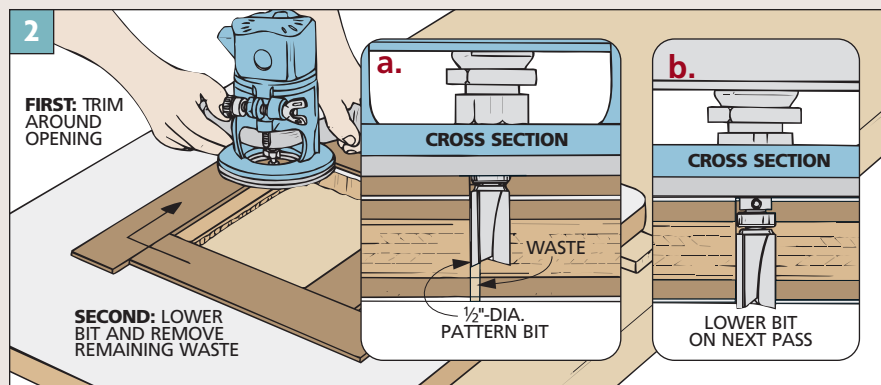
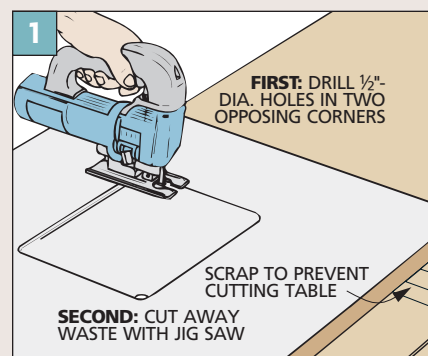
LAYOUT. To lay out the opening, start by using the insert plate as a template. A framing square makes it easy to center the plate on the table, allowing you to position the insert plate square with the edges of the table. Now hold the plate firmly in place (some carpet tape will help in doing this) and carefully trace around the edges.

ROUGHING OUT. Now use these lines as a guide for cutting out the opening. Start by drilling a couple of starter holes on opposite corners of the waste area. Then use a jig saw to rough out the opening, staying about $\frac{3}{16}$ " away from the layout lines (Fig. 1).

TRIM OPENING. After rough-cutting the opening, the last step is to trim the edges to match the size of the insert plate. To do this, tape down some strips of $\frac{1}{4}$ " hardboard along the lines on the top.

Once the strips are in place, the opening can be trimmed with a router and a pattern bit (Fig. 2). You'll need to do this in two passes, since most pattern bits are only 1" long (Figs. 2a and 2b).

ATTACHING CLEATS. With the opening complete, you can attach the cleats that hold the insert plate in place. To position the cleats, flip the top face-down on a flat surface. Then drop the plate in the opening and glue and screw the cleats in place (refer to Fig. 3 below).



Note: If need be, file down or sand the sharp edges of the laminate that are left behind by the flush trim bit.

INSERT PLATE. At this point, the top is almost complete. All that remains to be added is an insert and a slot for a miter gauge. I decided to use an insert plate that's made out of phenolic (a hard, dense plastic). The nice thing about this plate is that it lifts right out along with the router so you can change bits easily.

Note: If you plan on using a plunge router with this table, you may have to use a larger insert plate.

The insert plate fits into a simple opening (Fig. 3). (To rout the opening, see the Technique box above.) Hardwood cleats (E, F) are screwed to the sides of the opening and support the insert plate so it's flush with the top (Fig. 3a).

MITER GAUGE SLOT. The miter gauge slot for this Router Table is made up of two separate aluminum extrusions — an L-shaped piece and a T-track (Fig. 6a). Together, these parts form a slot for the miter gauge. And the T-track makes it easy to attach a featherboard using a couple of knobs and toilet flange bolts.

Note: I used a product called Dual Track. This unique product can be

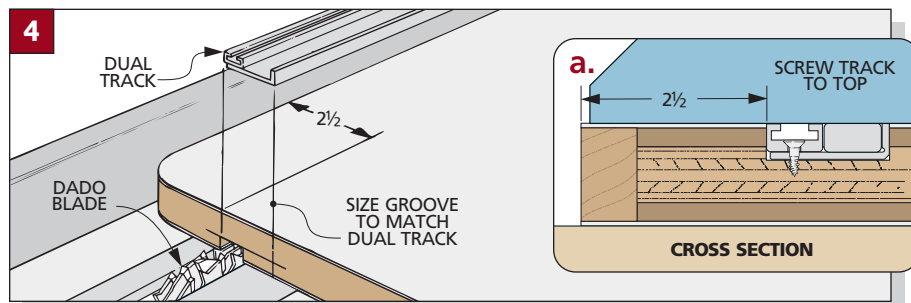
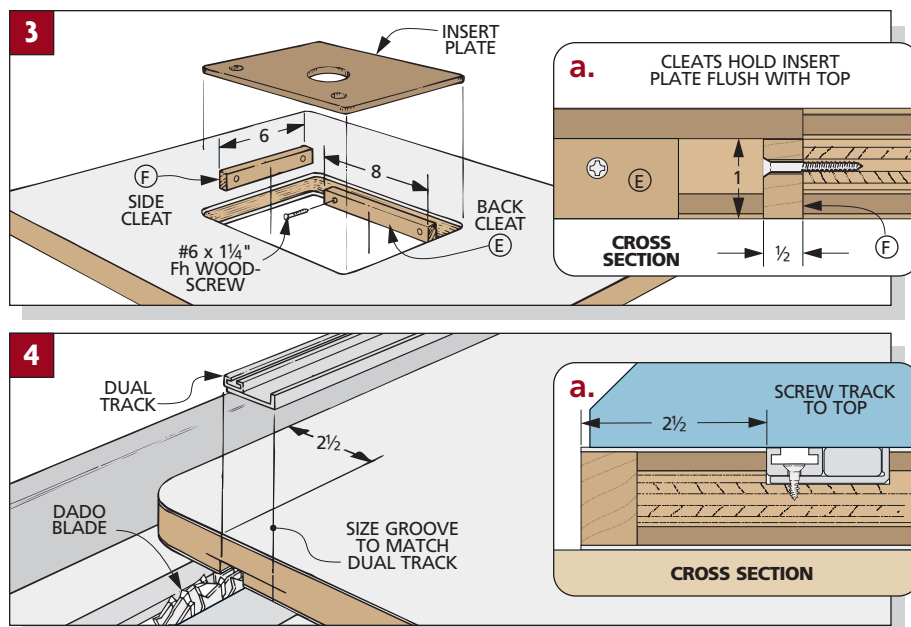
bought exclusively from Woodsmith Project Supplies. To find out how to order it, refer to Sources on page 126.

Before you can cut the groove for the Dual Track, you'll need to assemble it. I used my miter gauge as a spacer and simply glued the T-track to the L-shaped piece with instant glue.

Note: Wrap some paper around the miter gauge bar for a perfect sliding fit.

A dado blade can be used to cut a groove in the top for the assembled track pieces. This groove matches the width and thickness of the track (Fig. 4).

Once the groove is cut, the two pieces of track are screwed in place (Fig. 4a).



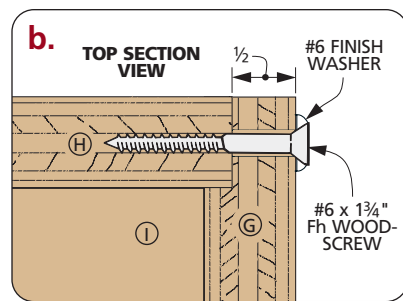
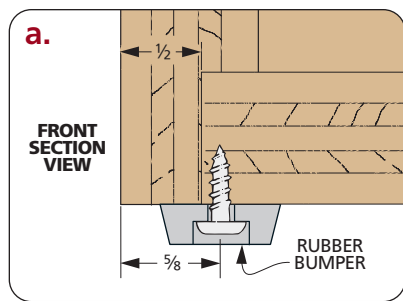
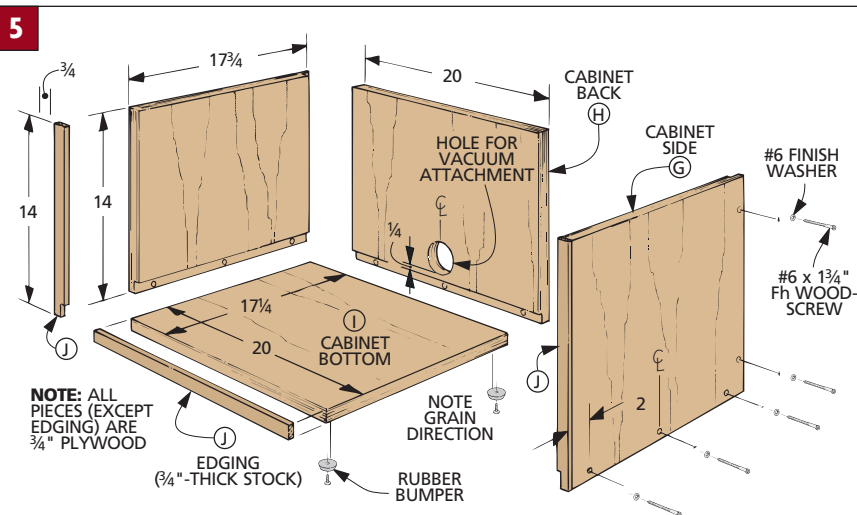
With the top of the table complete, you can start work on the base. There are actually two parts to it. The tabletop is fastened to a small cabinet that houses the router. This cabinet in turn sits on a stand with a large drawer and a storage area below. The corners of this stand are covered by aluminum angle.

With this arrangement, you can easily lift off the upper section of the Router Table and take it with you to a job site while leaving the stand behind. When the cabinet is set in place on the stand, the pieces of aluminum angle act as a set of cleats to keep the cabinet in place.

PLYWOOD BOX. The cabinet is really just a small plywood box that's open in the front for access to the router (*Fig. 5*). To start with, I cut the sides (G), back (H), and bottom (I) to size from $\frac{3}{4}$ " maple plywood. When laying out and cutting these pieces, I paid particular attention to the grain direction. (For best looks, the grain should run up and down.)

To hide the exposed edges of the plywood, the front edges of the sides and bottom are covered with hardwood edging. To make this edging, I simply ripped $\frac{1}{4}$ "-wide strips from the edge of a $\frac{3}{4}$ "-thick piece of maple stock. Then I glued the edging (J) to the front edges of the sides and bottom and trimmed it flush with a router before assembling the Router Table cabinet.

The cabinet is simply held together with glue and screws. But I did use rabbets to increase the glue surface and to help keep the pieces aligned during the assembly process (*Fig. 5b*).

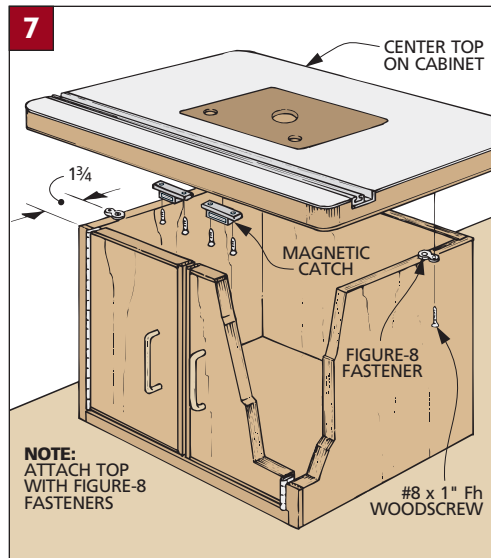
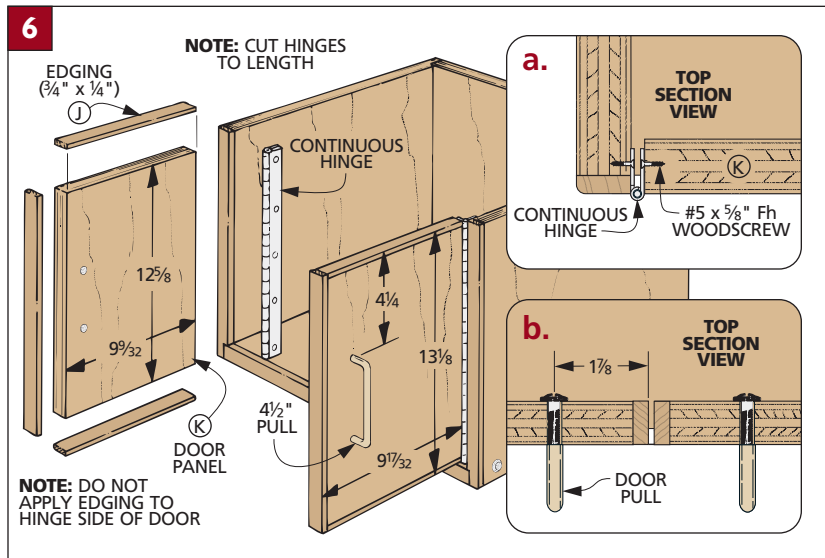


I used the table saw with an auxiliary fence clamped to my rip fence and a dado blade to cut the rabbets. The sides are rabbeted to hold the back and the bottom. And the back is rabbeted along one edge to hold the bottom.

Before assembling the Router Table cabinet, I drilled a large hole in the back for a shop vacuum hose outlet (*Fig. 5*). Hooking the Router Table up to a shop

vacuum not only keeps the inside of the cabinet clean by removing sawdust and chips, it also pulls air across the router, allowing it to run cooler.

Once this hole is drilled, you can glue up the cabinet. While the glue is drying, drill pilot holes and install the screws and finish washers on the sides and back of the cabinet. When these are in place, you can remove the clamps.



HARDWARE. To complete the cabinet, all that's needed is to add the remaining hardware. First, a pull is attached to the front of each door. Then a couple of magnetic catches are mounted inside the cabinet and to the back of the doors. Finally, four rubber bumper feet are fastened to the bottom of the cabinet to prevent the Router Table from shifting around during use (*Fig. 5a*). Once this is done, you can attach the top to the cabinet using figure-8 fasteners (*Fig. 7*).

The stand is also a plywood box that's assembled with rabbets, glue, and screws (*Fig. 8*). The stand contains a drawer as well as a storage area.

NOTE: GLUE EDGING TO PLYWOOD BEFORE CUTTING DADOES IN SIDES

a. FRONT VIEW

Dimensions and components shown in the diagram include:

- Divider dimensions: $17\frac{5}{8}$ (width) x $20\frac{5}{8}$ (height)
- Stand side dimensions: $17\frac{3}{8}$ (width) x $22\frac{1}{4}$ (height)
- Stand side depth: $5\frac{1}{8}$
- Stand side width: $3\frac{1}{8}$
- Components: (M) DIVIDER, (L) STAND SIDE, (J) EDGING ($\frac{3}{4}$ " x $\frac{1}{4}$ "
- Fasteners: #6 FINISH WASHER, #6 x $1\frac{3}{4}$ " Fh WOODSCREW

angle, I added some spacer blocks (P, Q, R, S) to the stand. These provide a place for mounting the aluminum angle as well as the drawer and door hardware. They're just $\frac{3}{4}$ "-thick pieces of hardwood that are glued to the front and back edges of the sides (*Fig. 9*). Once they're in place, you can make the drawer and doors.



DRAWER & DOORS

At this point, the carcase of the Router Table stand is complete. All you have to do now is add the drawer and make the doors for the storage compartment. To complete the base, I also added four leg levelers that can be adjusted up or down to level the table. (To make your stand mobile, add a set of casters. You can learn more about this in the Designer's Notebook on the next page.)

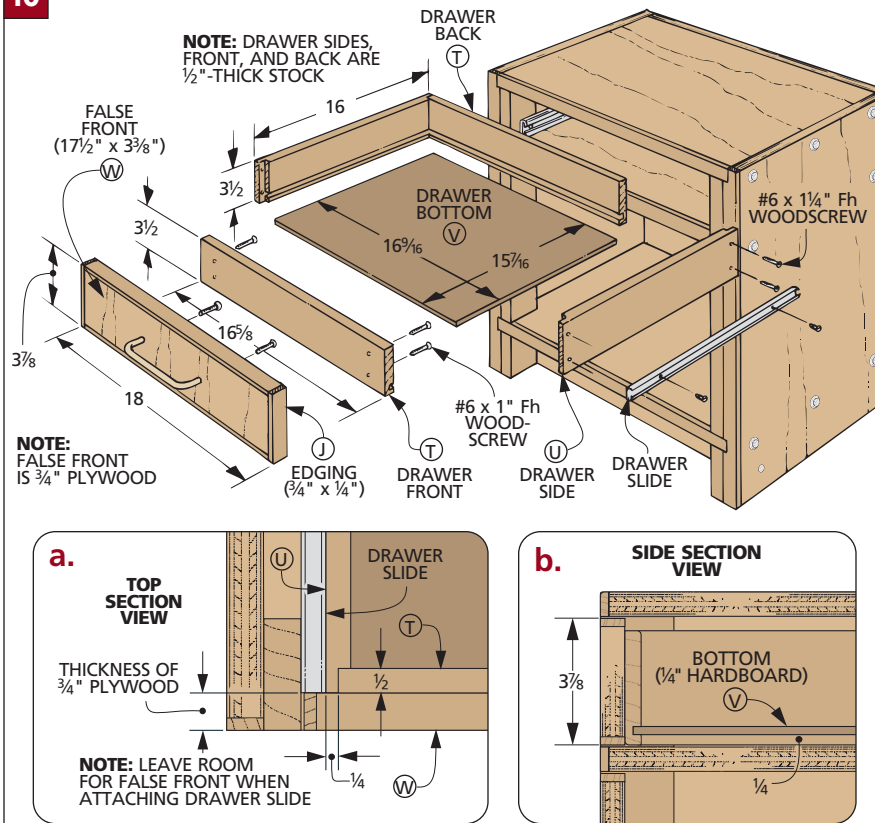
DRAWER. I decided to add the drawer first. It's made up of $\frac{1}{2}$ "-thick hardwood stock with a $\frac{3}{4}$ " plywood false front. The first step in building the drawer is to cut the front (T), back (T), and two sides (U) to final size (Fig. 10).

The drawer is joined with rabbet joints and held together with glue and screws. Rabbets are cut in the side pieces, one at each end (Fig. 10a). Then a groove is cut near the bottom edge of all four pieces to hold the drawer bottom (Fig. 10b). After cutting a piece of $\frac{1}{4}$ " hardboard for the drawer bottom (V), you can glue and screw the drawer pieces together.

DRAWER SLIDES. To make it easier to get to items at the back of the drawer, I used full-extension drawer slides. These can be separated into two pieces — one is screwed to the side of the drawer and the other is screwed to the inside of the drawer compartment. The important thing to note is that the slides should be set back far enough from the front edge of the stand to allow room for the false front that is added next (Fig. 10a).

FALSE FRONT. The false front (W) is made out of $\frac{3}{4}$ " plywood with $\frac{3}{4}$ "-thick hardwood edging all around (Fig. 10).

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The false front is sized to allow a $\frac{1}{16}$ " gap on all four sides of the drawer front. Once the edging is applied, the false front can be centered on the front of the drawer and screwed in place from the inside.

DOORS. Except for their size, the doors on the stand are identical to the ones you made for the cabinet. They are just a couple of plywood lower door panels (X) with hardwood edging (J) on three sides.

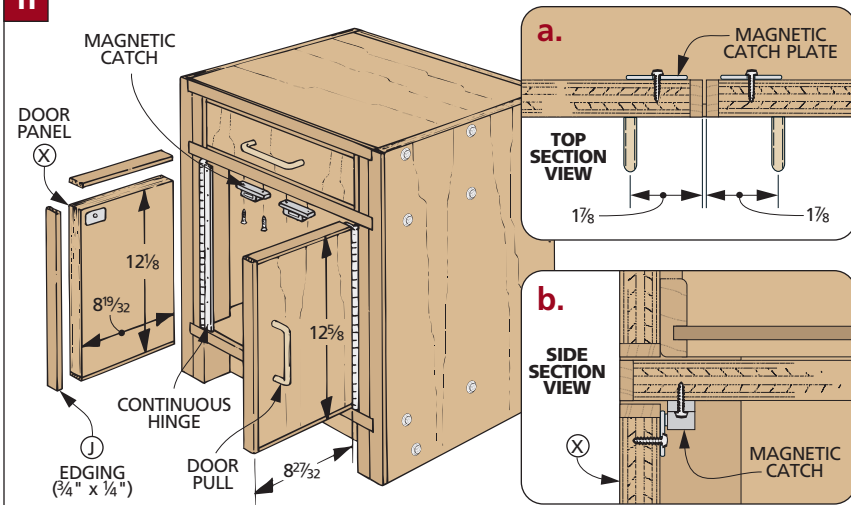
Once the edging is in place, the doors can be mounted to the stand with continuous hinges. (Cut the hinges down to size with a hack saw to fit the doors.)

HARDWARE. To complete the doors and drawer, I added some pulls to the front to match the ones on the cabinet doors. Then I mounted a couple of magnetic catches to the inside of the stand for the doors (Figs. 11a and 11b).



This stand can also be used with other portable power tools, such as a thickness planer or portable band saw.

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ALUMINUM. At this point, all that remains is to add a couple of finishing touches to the Router Table. The most obvious of these is the aluminum angle that is applied to each corner. Besides strengthening the cabinet and protecting the corners, the aluminum angle also creates a lip to position the upper cabinet on the lower cabinet.

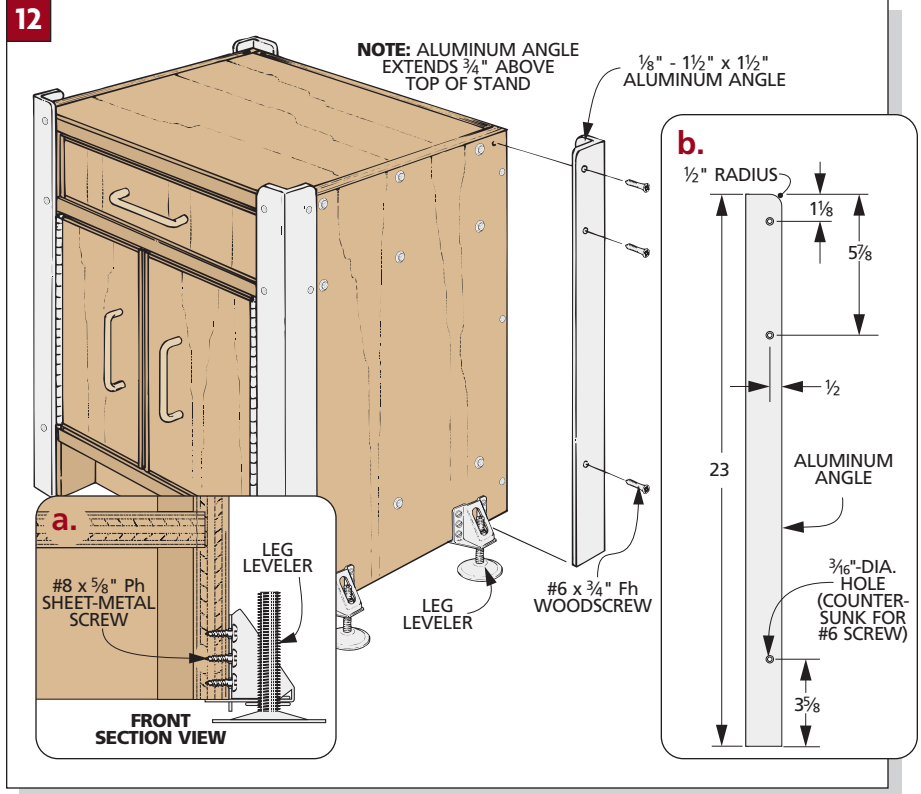
The way this works is quite simple. The aluminum angle is cut $\frac{3}{4}$ " longer than the height of the stand. This way, when it is attached to the corners, the ends will stick up and create a lip that holds the upper cabinet in place.

Since aluminum is a soft metal, it can be easily cut with a hack saw. You could also cut the aluminum on a table saw using a carbide-tipped blade.

Safety Note: Do not try to cut the aluminum on your table saw unless you have a carbide-tipped blade.

Once the aluminum is cut to length, you can drill and countersink all of the screw holes. A few seconds on a disc or belt sander will round over the top corners of the aluminum angle (Fig. 12b). Then the aluminum angle can be screwed to the corners of the stand.

The final pieces of hardware to add are the four leg levelers (Fig. 12a). The ones I chose are really slick. They simply



screw to the sides of the stand. But the nice thing about the leg levelers is that they can be adjusted easily with just an Allen wrench, without having to reach

underneath the stand or turn it upside down. Once these are attached to the sides, you can apply a finish and mount your router to the insert in the top.

DESIGNER'S NOTEBOOK

A set of swivel casters allows you roll the Router Table out of the way when more space is needed.

CASTERS

■ To modify the Router Table stand from a stationary tool into one that can be rolled around when needed, you can simply add a set of 5" swivel casters. But to do this, you'll first need to modify the stand to make a little extra room.

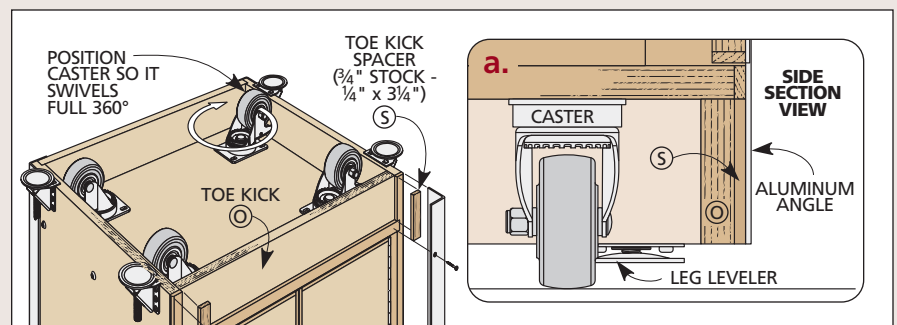
■ There's plenty of room at the back of the stand to install the casters (see drawing). But if you were to try and install the toe kick as before (so that it's set back from the front $2\frac{1}{4}$ "), the casters end up too far towards the center of the stand, which would make it extra "tippy."

To solve this problem, I've simply moved the toe kick out 2". The idea is to position the caster as close to the cabinet front and sides as possible, but still allow it to swivel freely a full 360°.

■ The toe kick (O) is built exactly the same as before (see drawing).

■ To provide support for the aluminum angle that's added later, I ripped the toe kick spacer (S) so that this time it's only $\frac{1}{4}$ " wide (detail 'a'). Finally, I installed all four 5" swivel casters.

Note: Always lower the leg levelers so the stand is fully supported before operating any portable power tool.



MATERIALS LIST

CHANGED PART

S Toe Kick Spacers (2) $\frac{3}{4}$ x $\frac{1}{4}$ - $3\frac{1}{4}$

HARDWARE SUPPLIES

(4) 5" swivel casters w/ mounting screws
(16) No. 8 x $\frac{5}{8}$ " woodscrews

MATERIALS LIST

WOOD

Y Fence (1)	$\frac{3}{4}$ x 3 $\frac{1}{2}$ - 36
Z Spacer (1)	$\frac{3}{4}$ x 1 $\frac{1}{32}$ - 36
AA Sliding Faces (2)	$\frac{3}{4}$ x 2 $\frac{1}{16}$ - 18
BB Positioning Blocks (2)	1 $\frac{1}{4}$ x 2 - 2 $\frac{1}{16}$
CC Hold-down Blocks (2)	$\frac{3}{4}$ x 1 $\frac{1}{4}$ - 2

HARDWARE SUPPLIES

- (8) No. 8 x $\frac{1}{2}$ " Fh woodscrews
- (8) No. 8 x 1" Fh woodscrews
- (2) 36" T-tracks w/ screws
- (4) $\frac{5}{16}$ " x 1 $\frac{3}{4}$ " toilet flange bolts
- (6) $\frac{5}{16}$ " through-hole star knobs
- (8) $\frac{5}{16}$ " flat washers
- (1) 2" x 2" alum. angle ($\frac{1}{8}$ " x 42" rough)
- (2) $\frac{5}{16}$ " x 2 $\frac{1}{2}$ " hex-head bolts
- (2) $\frac{5}{16}$ " lock nuts
- (1) 2" wide x 6"-long anti-skid tape



FENCE

This shop-built Router Table fence is made out of a few board feet of lumber and some commonly available hardware. The only part that you probably won't be able to find at your local lumberyard or hardware store is the aluminum track at the top of the fence and on the back of the sliding faces (see page 126 for sources).

This fence clamps firmly to your Router Table and provides a rigid, straight surface for guiding your workpieces. The two front faces are adjustable for different

size bits. And the T-track along the top of the fence allows you to add handy accessories, like a bit guard or featherboard.

ALUMINUM ANGLE. The aluminum angle is the secret to making the fence strong, yet lightweight (*Fig. 13*). It serves as the backbone of the fence.

To make the fence, I started by cutting the 2" x 2" aluminum angle to length and drilled holes for the hardware that's used to attach the various parts of the fence to the aluminum (*Figs. 13a and 13b*).

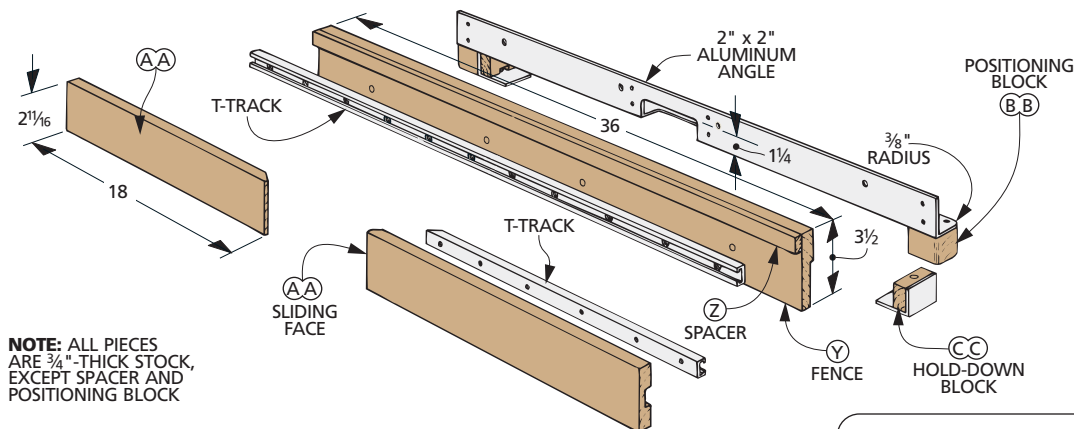
After the holes are drilled, you can lay out the bit opening in the middle of the

aluminum angle. To remove the waste, drill holes in the corners and cut away the waste with a jig saw and a metal-cutting blade (*Figs. 14 and 15*). You may need to clean up the edges with a file.

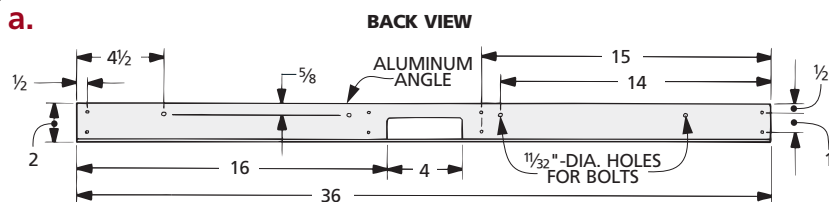
The last bit of work to do on the aluminum is to radius the two back corners (*Fig. 13b*). This can be done quickly on a disc or belt sander.

FENCE. The aluminum angle gets attached to a fence (Y) that's just a piece of $\frac{3}{4}$ "-thick hardwood with a shallow rabbet cut along one edge to receive the angle (*Fig. 16*). After cutting the rabbet,

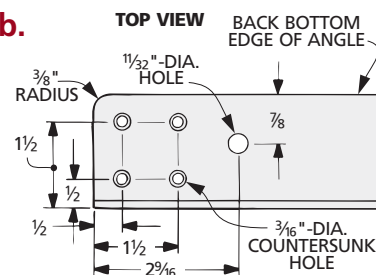
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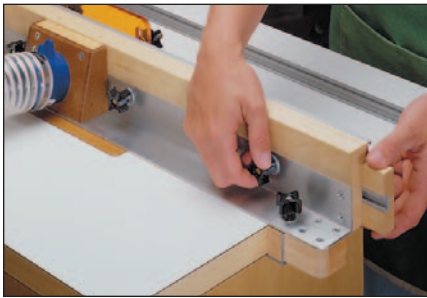


a.



b.





You can make your router table even more versatile by adding this shop-built fence. It features adjustable sliding faces to accommodate different size router bits.

the aluminum angle can be screwed to the back of the fence. Then four holes can be drilled through the fence for the toilet flange bolts that will attach the sliding faces later (*Fig. 13a*).

It's hard to get good results when you're routing a workpiece against a fence that's twisted or bowed. And while the aluminum angle was pretty straight, I wanted to make sure the front face of the fence was as straight and flat as possible. So once it was mounted to the aluminum, I took a couple of light passes on a jointer to flatten the wood face of the fence.

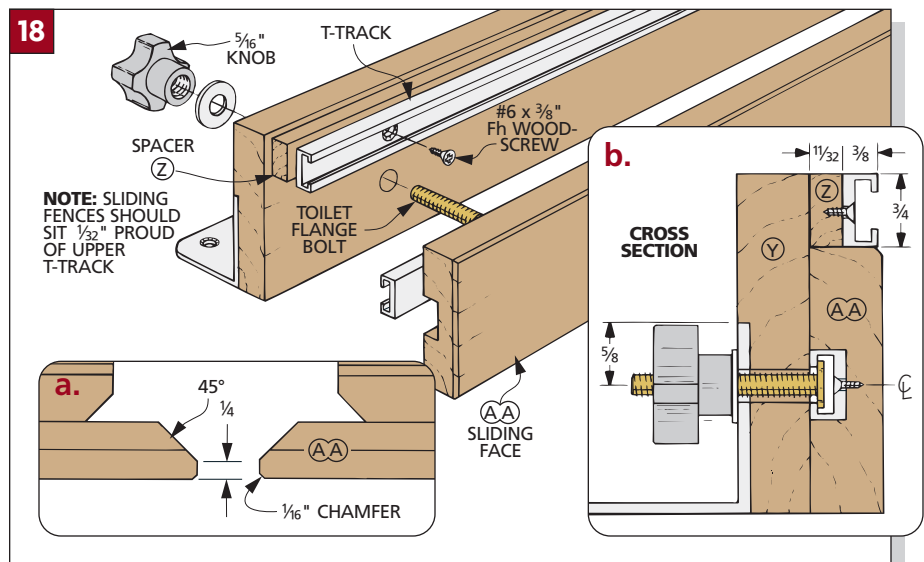
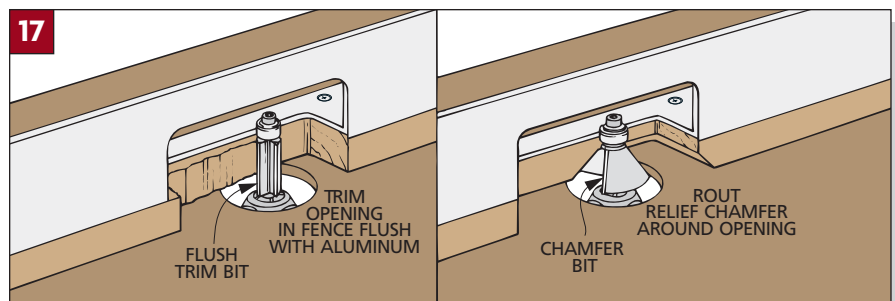
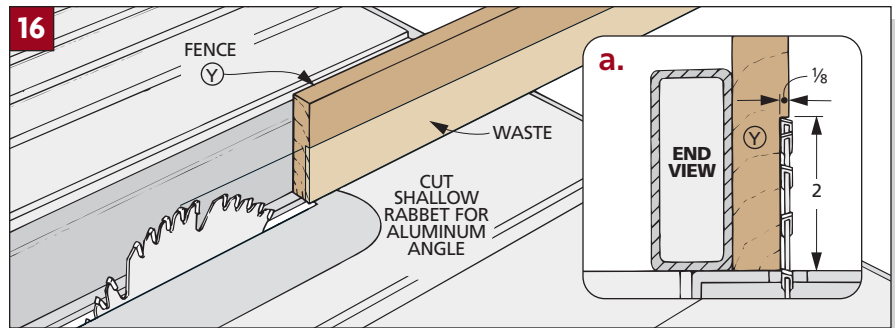
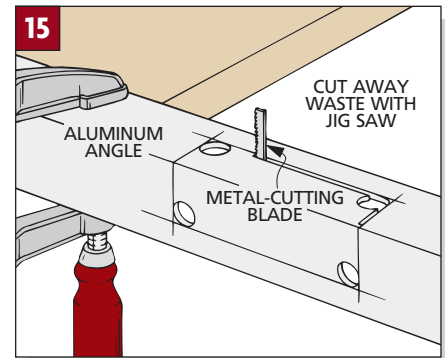
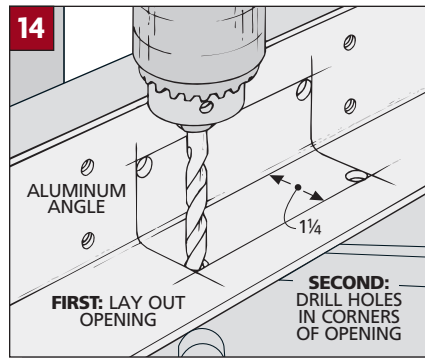
Now that the fence is flat, you just need to cut out the area of the bit opening. You can use a metal-cutting blade in a jig saw to remove most of the waste and then come back with carbide-tipped router and flush trim bits to clean up the opening (*Fig. 17*). After the opening is trimmed flush, a chamfer is routed along the inside edges to provide clearance for all your extra-large bits.

T-TRACK. A great thing about this fence is the T-track that runs along the top. It allows you to attach a bit guard or a featherboard at any point along the length of the fence without having to use clamps.

The T-track is mounted to a spacer (Z) that is in turn glued to the front of the face (*Fig. 18*). The thickness of this spacer is important. You want to make sure that the T-track won't extend beyond the sliding faces that will be added later.

After gluing the spacer flush with the top edge on the front of the fence, I added the T-track. This is just screwed in place.

SLIDING FACES. Right below the spacer and T-track are a couple of sliding faces (AA) (*Fig. 13*). These slide on a second piece of T-track. The two faces start out as a single, $\frac{3}{4}$ "-thick blank, slightly over 36" long. A groove is cut down the center of the blank to hold the T-track that is used to attach the faces to the fence.



(Make sure that the groove lines up with the holes in the fence.)

After the groove is cut and the T-track is screwed in place, the blank can be cut into two 18"-long faces. Then the ends of

the sliding faces are chamfered to create clearance for the bit (*Fig. 18a*). Finally, the sliding faces are attached to the router table fence with toilet flange bolts and plastic knobs (*Fig. 18b*).



A piece of self-adhesive anti-skid tape helps provide a firm grip for the fence hold-down, ensuring that the fence stays put when in use.

FENCE HOLD-DOWNS

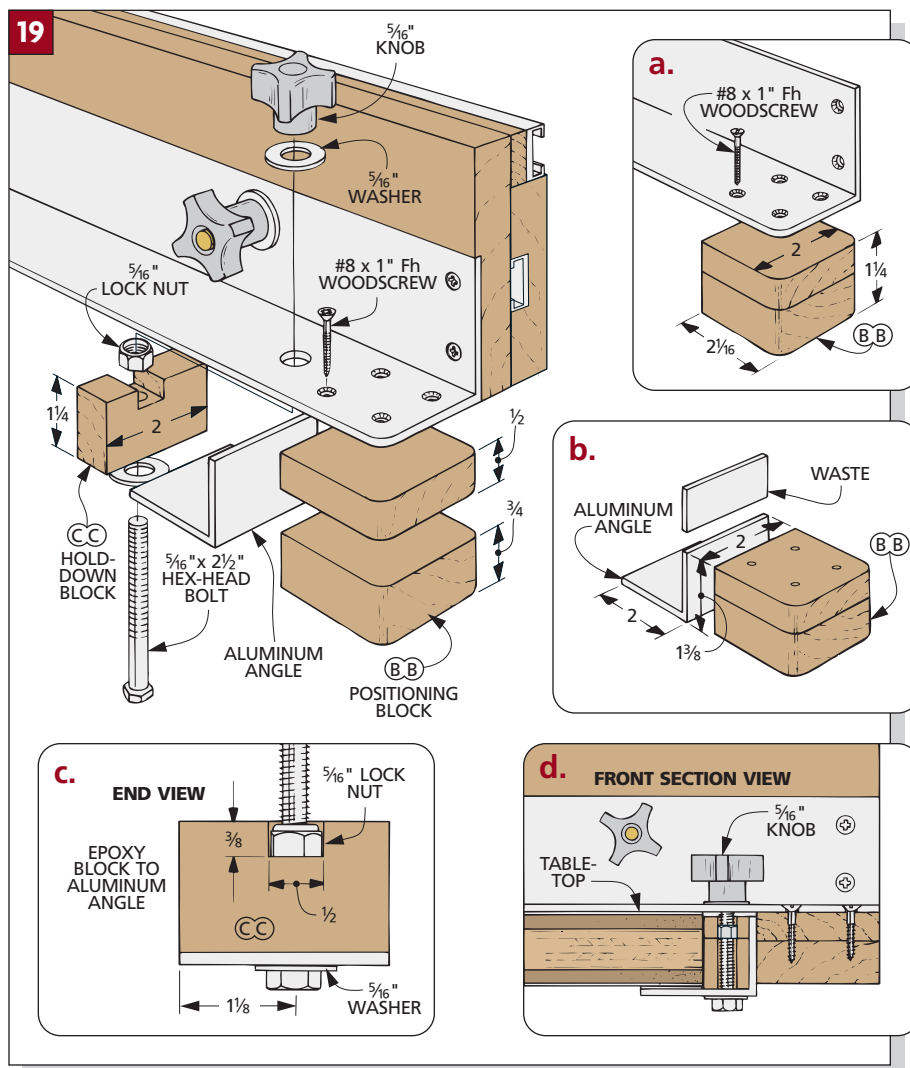
Designing the last part of the fence proved to be the most challenging. The trick was to figure how to securely clamp the fence to the top of the Router Table, but still allow it to be easily adjusted.

The solution I came up with was a simple one. It's just a couple of small hold-downs made out of a piece of aluminum angle and a wood block.

These hold-downs are attached to each end of the fence. When the star knobs are tightened down, the aluminum angle grips the edge of the Router Table top with surprising force.

A couple of thick wood blocks attached to each end of the fence prevent the hold-downs from rotating out of position when moving the fence over the Router Table top. These positioning blocks (BB) are made first. I glued up two pieces of stock for each block, ending up with a finished thickness of $1\frac{1}{4}$ ". Then, as you can see, these blocks are attached to the fence (Fig. 19a). Before they're screwed in place, the sharp corners of the blocks are relieved on a sander (Fig. 19b).

HOLD-DOWNS. Making the hold-downs that secure the fence to the table is a little more involved than making the positioning blocks. Each one is made up of a short piece of aluminum angle. But in order for the hold-down to match the thickness of the Router Table top, you'll have to cut down one side of the aluminum angle (Fig. 19b).



In order to bolt the aluminum angle to the inside of the fence, a wood block is epoxied to the inside of the angle (Fig. 19c). Before these blocks are glued in place, you need to do a little work on them.

The first step after cutting the hold-down blocks (CC) to size is to drill a hole for a bolt in both the block and the aluminum angle. To do this, clamp the block to the inside of the aluminum angle. Then place the block with the aluminum angle against the positioning block on the fence and mark out the location for the bolt (using the hole that's already drilled in the fence as a template). Now you can drill a bolt hole through the hold-down block and the aluminum angle.

To prevent the bolt from spinning when tightening the knob on the hold-down blocks, I used a couple of lock nuts. A small notch is cut in the top of each hold-down block to receive the nut. The trick is to size the width of the notch so the nut fits in snug. This will keep the

nut from turning once the hold-down is assembled (Fig. 19c).

ASSEMBLY. Assembling the hold-downs is pretty easy. Start by inserting a lock nut into the notch on each hold-down block (Fig. 19d). Then epoxy the blocks to the aluminum angle. (Be careful to not get epoxy into the hole for the bolt.)

Now, to attach the hold-downs, simply thread a $2\frac{1}{2}$ "-long bolt (with a washer) through the aluminum angle and the block. A plastic knob then secures the assembly to the fence.

Finally, to help give the hold-downs a little more gripping power, I placed a piece of self-adhesive anti-skid tape on the inside face of the aluminum angle (see photo above left).

FINISH. To help protect the wood surfaces of the fence, I wiped on a couple coats of an oil finish. Then after the finish dried, I applied a coat of paste wax to the fence and sliding faces to reduce friction and to make them easier to adjust. ■

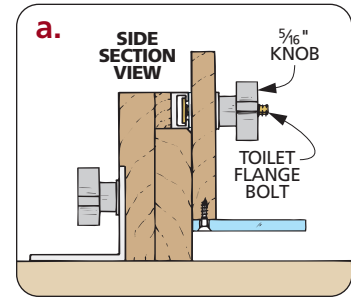
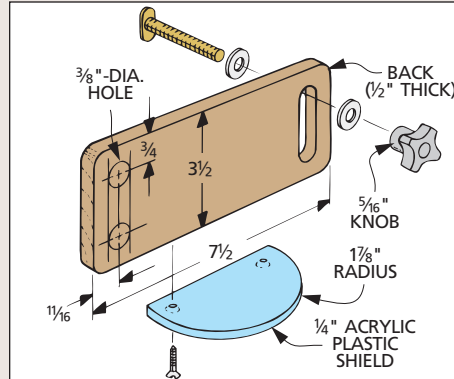
ACCESSORIES Fence Accessories

BIT GUARD

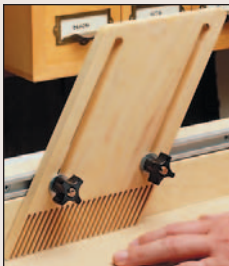


This bit guard is designed to be fastened to the T-track that runs along the top of the fence. The bit guard consists of a 1/2"-thick hardwood

back and a shield made from 1/4" acrylic plastic (see drawing). After cutting two adjustment slots in the back, the shield is screwed in place (see detail 'a').

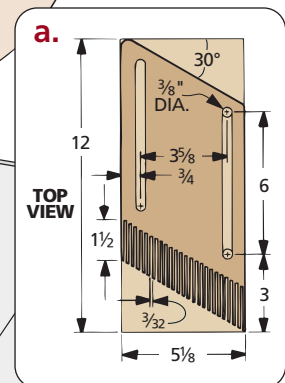
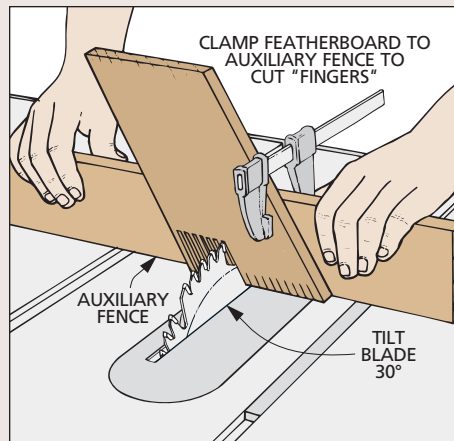


FEATHERBOARD



One nice thing about this featherboard is that it can be attached to the fence or the top of the table. It's just a piece of 1/2"-thick hardwood with 30° miters

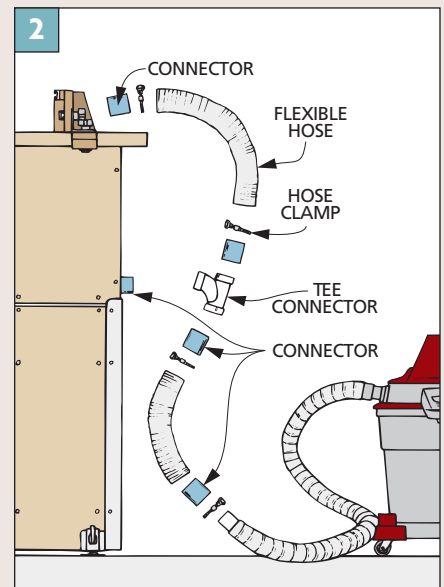
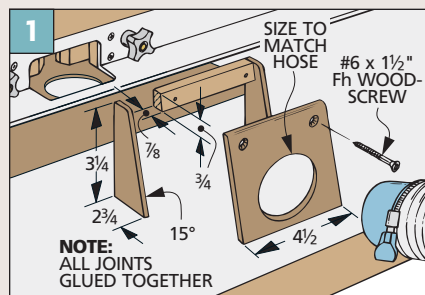
at each end. To cut the narrow slots that form the fingers, I tilted the table saw blade and clamped the featherboard to an auxiliary fence attached to the front of the miter gauge (see drawing).



DUST COLLECTION



This shop-made hood helps remove sawdust. It's added to the back of the Router Table fence. I made it out of a few pieces of hardboard and a strip of hardwood. It's screwed directly to the back of the fence (Fig. 1). With a few plastic fittings, you can pick up even more by attaching your vacuum to the back of the cabinet as well as the fence (Fig. 2).



DESIGNER'S NOTEBOOK

The base works great in small shops — where space for portable power tools is at a premium. And this lightweight stand is an easy-to-build accessory that puts your benchtop tools at just the right height.

CONSTRUCTION NOTES:

■ I use the Router Table base as a stand for more than just a router table. But I found that it's just a little too low for some of my portable benchtop power tools. So I designed an Extension Tool Stand that adds about 10", raising the stand's work-surface to a more comfortable height.

As you can see, the stand is just a four-sided box made from $\frac{3}{4}$ " plywood.

■ Start construction by cutting the box top (DD), bottom (DD), and sides (EE) to size from $\frac{3}{4}$ " plywood (see drawing).

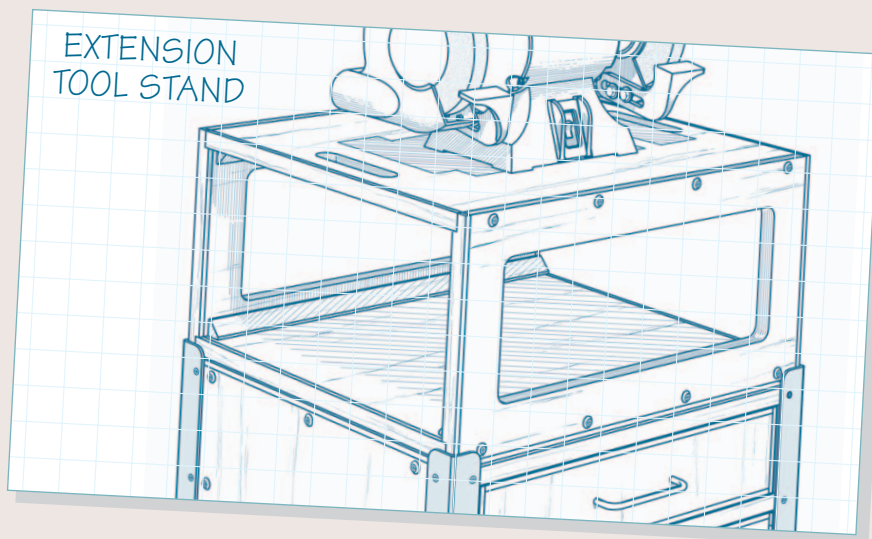
■ The plywood top and bottom are identical, except for one thing — the top has two handles added to make carrying the base easier. To add the handles, I simply drilled a couple of 1"-dia. starter holes and removed the waste between them with a jig saw (see drawing).

■ In order to make the box as light as possible, I cut a large opening centered in each side piece. Once again, I made these cutouts by drilling a series of starter holes at all four corners. Then I removed the waste with a jig saw (detail 'b').

■ To hide the exposed edges of the plywood stand, the front and back edges are covered with hardwood edging. I used $\frac{1}{4}$ "-thick hardwood for the top (FF), bottom (FF), and side (GG) edging pieces and glued them in place (see drawing). (Don't add edging to the long edges.)

■ Next, cut the rabbets on the box sides (EE) to hold the top and bottom pieces (detail 'a'). These rabbets increase the glue surface and add a little strength to the stand once it's assembled.

■ Now glue up the box, drill pilot holes, and install the screws and finish washers.

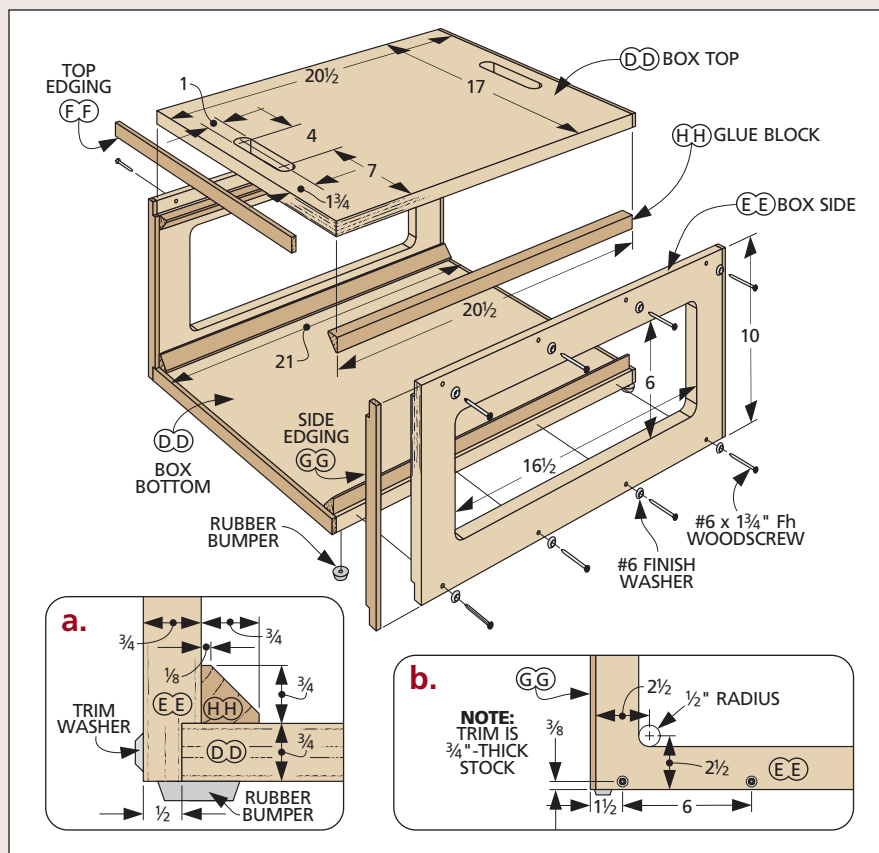


■ To add even more support to the box and keep it from racking, I added a set of four glue blocks — one on each inside corner of the stand (see drawing).

The glue blocks (HH) are just narrow strips that I ripped from the edge of an

extra-wide piece of $\frac{3}{4}$ " stock (detail 'a'). Before I ripped each piece to width, I routed a $\frac{5}{8}$ "-wide chamfer along one edge, then I glued the blocks in place.

■ Finally, add four rubber bumper feet to the bottom of the box (detail 'a').



MATERIALS LIST

NEW PARTS

DD Box Top/Bottom (2)	$\frac{3}{4}$ ply - 17 x 20 $\frac{1}{2}$
EE Box Sides (2)	$\frac{3}{4}$ ply - 10 x 20 $\frac{1}{2}$
FF Top/Btm. Edging (2)	$\frac{1}{4}$ x $\frac{3}{4}$ - 17
GG Side Edging (2)	$\frac{1}{4}$ x $\frac{3}{4}$ - 10
HH Glue Blocks (4)	$\frac{3}{4}$ x $\frac{3}{4}$ - 20 $\frac{1}{2}$

HARDWARE SUPPLIES

(16)	No. 6 x $\frac{1}{4}$ " Fh woodscrews
(16)	No. 6 finish washers
(4)	$\frac{3}{4}$ " rubber bumpers w/ screws

Router Jointer

You don't need to spend a load of cash on a power jointer, or even learn how to use a jointer plane. All it takes to get a perfectly straight edge on a workpiece is a hand-held router and this shop-made jig.



Getting a smooth, straight edge — it's one of the most important steps to a successful project. To create this edge, you could use a hand plane or a power jointer. Or you can do the job with this simple jig and a router.

JOINTER. In some ways, this Router Jointer is similar to the stationary jointers you'll find in a lot of home workshops — both use a revolving cutterhead to produce a clean, straight edge. On a stationary jointer the workpiece is pushed along a flat bed, past a stationary cutterhead. But with this jig, the workpiece is stationary and the cutter (a straight bit) moves across the edge.

The jig is made up of just two main parts: a platform with a guide system, and a sliding carriage to hold the router.

PLATFORM. The platform couldn't be much simpler. It's just a plywood base with a pair of hardwood runners screwed along one edge. It's designed to hold both wide and narrow stock and can joint boards up to 48" long. A shallow groove in the platform base creates a reference line for positioning the workpiece.

GUIDE SYSTEM. The runners act as a guide system to help keep the router carriage tracking straight. Cut-offs saved from the ends of these extra-long runners serve two purposes. First, they're

used to space the runners during assembly of the platform base. And then, one of the cut-offs serves as a guide bar for the router carriage.

CARRIAGE. To hold the router in position so you can rout a straight edge, you also need to build a simple sliding carriage. The carriage is just an auxiliary base (made from 1/4" hardboard) that gets screwed to the guide bar. Then the auxiliary base is attached to the router.

USING THE ROUTER JOINTER. Once you have the Router Jointer platform and sliding carriage built, the learning curve for using the jig is pretty simple. (See the Technique box on page 77.)

MATERIALS LIST

WOOD

- A** Base (1) $\frac{3}{4}$ " ply - 16 x 48
B Guide Rails (2) $\frac{3}{4}$ x 1 $\frac{1}{4}$ - 48
C Auxiliary Base (1) $\frac{1}{4}$ " hdbd. - 7 x same as router base
D Guide Bar (1) $\frac{3}{4}$ x 1 $\frac{1}{4}$ - 8

HARDWARE SUPPLIES

- (10) No. 8 x 1 $\frac{1}{4}$ " Fh woodscrews
 (3) No. 8 x $\frac{3}{4}$ " Fh woodscrews

PLATFORM

There are two basic parts to this Router Joiner: a platform and a sliding carriage.

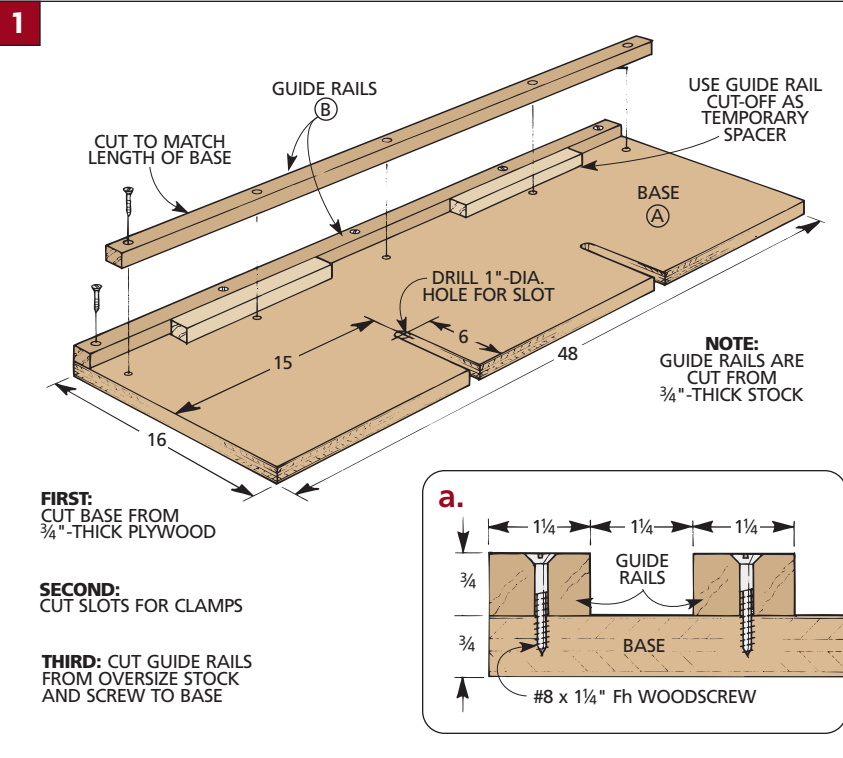
BASE. I started by building the platform. It's just a $\frac{3}{4}$ " plywood base (A), and two guide rails (B) (Fig. 1). The base should be wide enough to support the widest stock you're likely to work on. In most cases, my widest stock is no more than 7 $\frac{1}{2}$ ". (I made my base 16" wide.)

The length of the base (A) determines the maximum length of the workpiece that can be jointed. The length of the platform could be as long as you like, but for me, the most practical length was 48". This way the Router Joiner is easy to store when it's not being used.

Note: When you cut the base, avoid trimming away the factory edge of the plywood. Then when you assemble the platform later, this straight edge makes it easier to position the guide rails.

To clamp short or narrow stock to the base, a pair of 1"-wide slots are cut in from the front edge (Fig. 1). To do this, I first drilled 1"-dia. starter holes, allowing plenty of room for a clamp. Then you can cut the slots using a jig saw.

GUIDE RAILS. All that's left to complete the platform is to add the two guide rails (B) (Fig. 1). These rails form a "track" to guide a sliding carriage for the router.



The thickness of these rails determines the maximum thickness of the workpiece. Since I do most of my work with $\frac{3}{4}$ "-thick stock, I made the guide rails the same thickness ($\frac{3}{4}$ ") (Fig. 1).

To make the rails, start by cutting two 1 $\frac{1}{4}$ "-wide blanks to a rough length of 60". Then, trim the guide rails to match the length of the base (48") (Fig. 1). And keep the cut-offs close at hand.

I used the cut-offs for two things. First, they serve as temporary spacers to position the guide rails. Then one piece is used to make the carriage.

ASSEMBLY. The important step in assembling the platform is to get the correct spacing between the guide rails. This ensures that the carriage will slide without binding or side-to-side play.

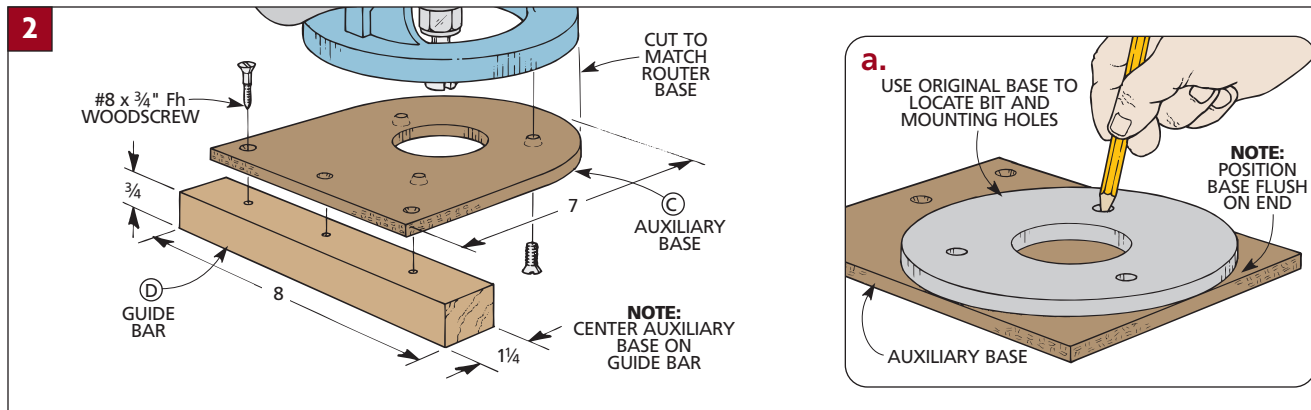
To do this, first screw one rail flush with the back edge. Then, put the spacers between the rails and screw the second guide rail in place.

Note: A sheet of paper slipped around the spacers will help to create a perfect sliding fit for the sliding carriage.

CARRIAGE

With the platform complete, work can begin on the carriage. It consists of an auxiliary base for your router and a hardwood guide bar (Fig. 2).

AUXILIARY BASE. The auxiliary base (C) is just a piece of $\frac{1}{4}$ " hardboard. One end of the base is screwed to the guide bar. The other end rests on your workpiece (see left photo on next page).



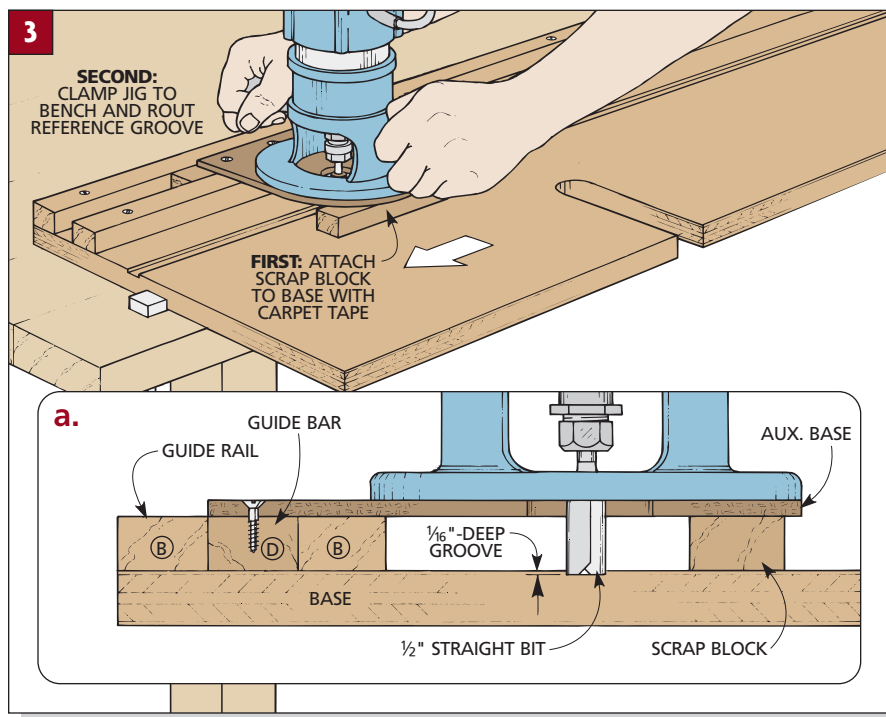
The auxiliary base is 7" long and cut to match your router base (Fig. 2). To locate the bit and mounting holes in the hardboard, use your original router base as a template (Fig. 2a).

GUIDE BAR. The next step is to add the guide bar (D) that rides in the "track" of the platform. To do this, cut one of the guide rail cut-offs to a length of 8". Then center the base on the guide bar and screw it in place (Fig. 2).

Now insert the straight bit (I use a $\frac{1}{2}$ " bit) and mount the router to the hardboard auxiliary base.

ROUT GROOVE. To create a reference for jointing the edge of a board, a shallow groove is routed in the base. (For more on setting up the jig, see the box below.)

Since there's no workpiece under the router, it can tip while routing. To prevent this, fasten a $\frac{3}{4}$ "-thick block to the bottom of the auxiliary base with some carpet tape. Then set the bit to cut $\frac{1}{16}$ "-deep, and rout the groove (Fig. 3).



TECHNIQUE

Using the Router Jointer

There are two steps to using the Router Jointer after you've clamped it to your bench. First, position the workpiece over the reference groove and clamp it to the jig (see drawing). A couple of slots allows you to clamp most narrow boards securely. Then it's just a matter of sliding the carriage to joint the edge.

Note: I waxed the inside of the guide rails and around the guide bar to ensure the router carriage would ride smoothly.

POSITION WORKPIECE. To position a workpiece, place the *rough* edge to be jointed so it extends about $\frac{1}{16}$ " over the groove in the base (see detail 'a'). Then clamp the board to the base. You want to make sure the board overhangs the same amount (or less) at both ends.

Depending on the board you're milling, you may need to make more than one pass. For example, if a board is bowed out in the center, start by positioning the board so this portion will be routed first. Just remember that the maximum overhang along the full length of the board is no more than $\frac{1}{16}$ " for a safe cut.

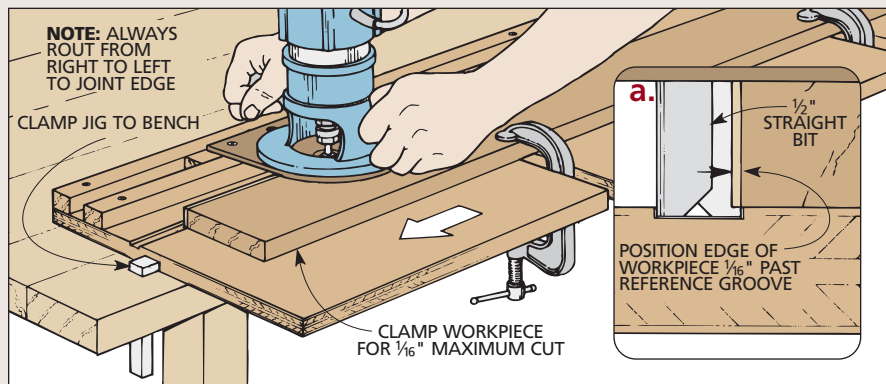
JOINT THE EDGE. Then, to joint the edge, slide the carriage along the guides from right to left. Don't stop once you get started. A single, smooth pass along the entire length of the board works best.



Router Jointer. With the platform clamped securely in place, clamp the board to the jig so it overhangs the groove no more than $\frac{1}{16}$ " along its length. The guide block keeps the bit aligned so you can make a smooth pass.



Thin Stock. If you want to joint stock that is thinner than $\frac{3}{4}$ " you'll need to support the carriage so it doesn't tip. To do this, use double-sided carpet tape to attach a piece of scrap wood as a spacer to the auxiliary base of the carriage.



Pocket Hole Jig

Use this simple Pocket Hole Jig to make long-lasting joints. All it takes are a router and a hand-held drill with an extra-long drill bit. Then a choice of two specially-made screws holds the joint together.



There are two good reasons for making a pocket hole joint. It's strong. And it's quick.

Basically, a pocket hole joint is a butt joint that's held together with specially-made fasteners called pocket hole screws. (For more information on the two styles of pocket hole screws, see the Shop Info box on page 83.) These special screws are driven into angled holes (pockets) in one piece. And they're guided into the adjoining piece by a pilot hole drilled in the end of the pocket.

As simple as it sounds, making a pocket hole joint by hand can be tricky. When drilling the angled pocket, the tip

of the bit tends to "skate" across the workpiece. Also, if the pilot hole isn't drilled at the correct angle, the screw may break through the "good" side of the workpiece when you assemble the project.

To get around this, there are several jigs and clamps available that are specially designed to make pocket hole joints. But they're fairly expensive. So I decided to make my own benchtop version of a Pocket Hole Jig.

ROUT THE POCKET. This jig uses a router to cut the pocket quickly and accurately, just where you want it. The router is mounted to a unique carriage that tilts out like the bin on a corner mailbox.

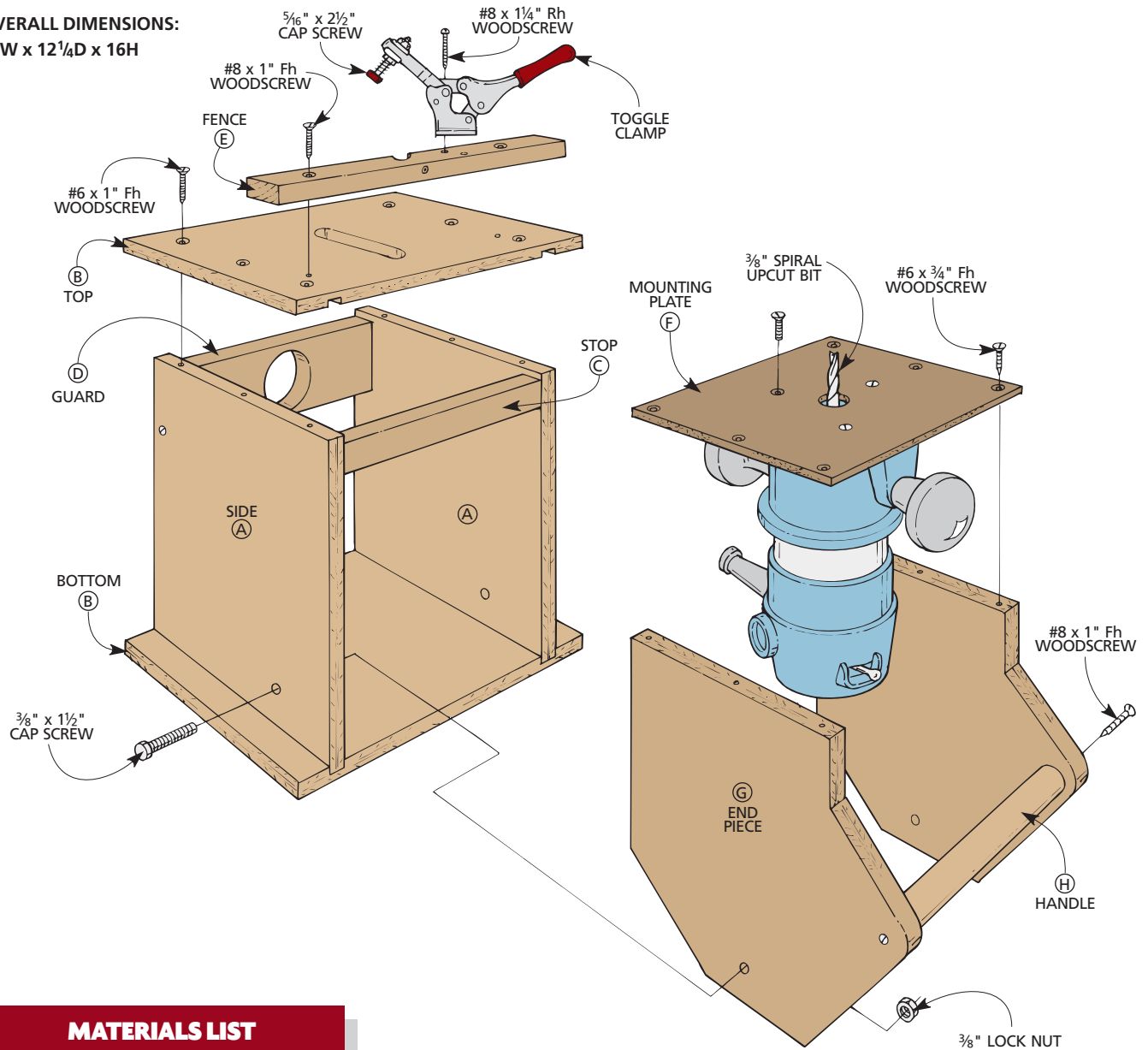
So with the workpiece clamped to the top of the jig, you just pull the handle of the carriage. As the router pivots forward, a spiral upcut bit scoops out a pocket in the bottom of the workpiece.

PILOT HOLE. The jig also makes it easy to drill the pilot hole — without having to guess if the bit is positioned at the correct angle. That's because there's a built-in guide to direct the bit at the right angle.

ASSEMBLY AND SETUP. Once you've completed both parts of the operation, assembling the joint is a snap. Simply screw the pieces together. And using the jig is easy, thanks to the Setup article starting on page 84.

EXPLODED VIEW

OVERALL DIMENSIONS:
12W x 12¹/₄D x 16H



MATERIALS LIST

WOOD

A Sides (2)	1/2 ply - 11 1/2 x 12 1/4
B Top/Bottom (2)	1/2 ply - 12 x 12 1/4
C Stop (1)	3/4 x 1 - 8
D Guard (1)	3/4 x 3 - 8
E Fence (1)	3/4 x 2 1/2 - 12
F Mounting Plate (1)	1/4 hdbd. - 7 x 8
G End Pieces (2)	1/2 ply - 10 x 10 1/2
H Handle (1)	1 dowel x 7

HARDWARE SUPPLIES

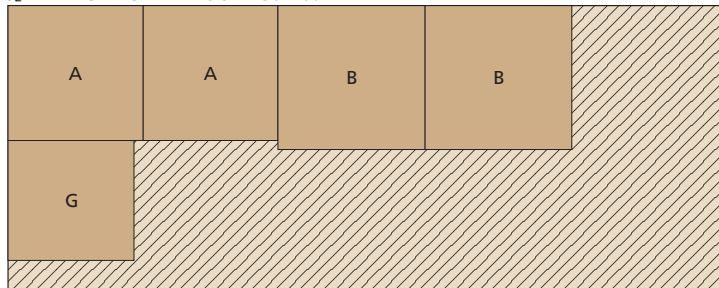
- (6) No. 6 x 3/4" Fh woodscrews
- (14) No. 6 x 1" Fh woodscrews
- (4) No. 8 x 1" Fh woodscrews
- (2) No. 8 x 1 1/4" Rh woodscrews
- (2) 3/8" x 1 1/2" cap screws
- (2) 3/8" lock nuts
- (1) Toggle clamp (De-Sta-Co No. 227)
- (1) 5/16" x 2 1/2" cap screw
- (1) 3/16" O.D. x 2" copper tube

CUTTING DIAGRAM

3/4 x 3 1/2 - 36 (.9 Bd. Ft.)



1/2" BALTIC BIRCH PLYWOOD - 30 x 60



NOTE: ALSO NEED ONE 12" PIECE OF 1" DOWEL FOR PART H AND ONE 12" x 12" PIECE OF 1/4" HARDBOARD FOR PART F

BASE

I began work on the Pocket Hole Jig by building the base. Together with a fence that's added later, the base supports the workpiece when making the pocket hole cut. And it also houses a carriage that holds the router.

To provide easy access to the router, the base is a plywood box that's open in front and back (*Fig. 1*). This box is quite simple — just two sides sandwiched between a top and bottom.

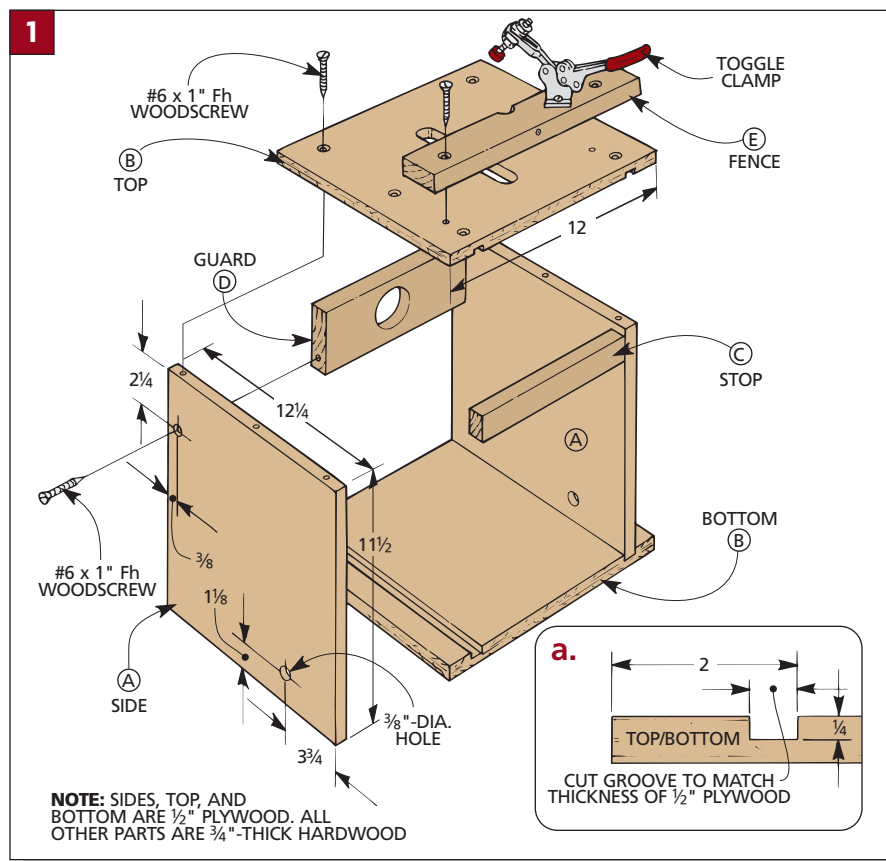
SIDES. Besides supporting the top, the two side pieces (A) provide a way to attach the router carriage. This requires drilling a hole in each side for a cap screw that acts as a pivot point for the carriage.

To ensure that the carriage operates smoothly, it's important that these holes align. So I fastened the sides together temporarily with some carpet tape and drilled both holes at the same time.

TOP AND BOTTOM. The next step is to add the top (B) and bottom (B) pieces. To accept the sides you'll need to cut a pair of $\frac{1}{4}$ "-deep grooves in each piece. These grooves are located so the top and bottom overhang the sides. This creates a clamping surface on the bottom that lets you secure the base to the bench.

CUT SLOT. Before gluing and screwing the base assembly together, cut a wide slot in the top (*Fig. 2*). As you pull the carriage forward to cut the pocket, this slot provides an opening for the router bit to stick through the top.

STOP. To prevent the carriage from tilting out too far (and cutting the pocket all the way through the end or edge of a



workpiece), I added a stop (C) (*Fig. 2*). It's a narrow piece of hardwood that bridges the opening between the sides.

GUARD. After gluing on the stop, I also added a hardwood guard (D). It covers the exposed router bit when the carriage is tilted in the back position. But the guard also doubles as an opening to hook up some dust collection. Making the opening is just a matter of cutting a centered hole

to fit the end of the hose on your shop vacuum. When that's done, the guard is glued and screwed in place.

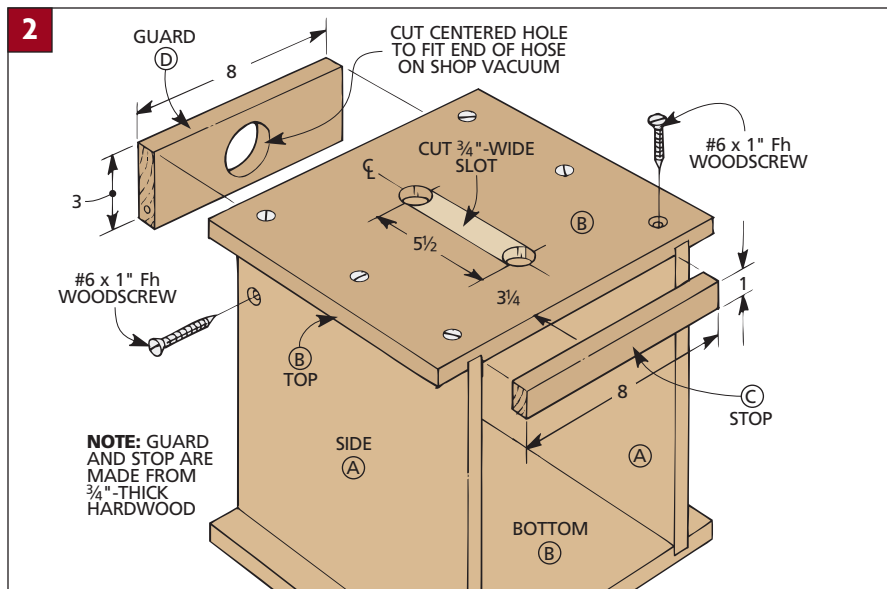
FENCE

With the base complete, you can turn your attention to the fence. It supports the edge of the workpiece as you make a cut. In addition, the fence has a built-in guide that allows you to accurately drill the pilot hole for the screw.

FENCE. The fence (E) is a piece of $\frac{3}{4}$ "-thick hardwood attached to the top of the base (*Fig. 3*). One thing you'll notice about the fence is there's a curved notch on the inside edge (the one that supports the workpiece) (*Fig. 4*). It provides a relief area for the chips to fall through when drilling the pilot hole. This relief area keeps the chips from jamming up against the fence.

GUIDE. After cutting the notch, you're ready to add the guide for the drill bit. It directs the bit into the workpiece at a slight (5°) angle.

And to keep the guide hole from being enlarged every time you use the jig, it's lined with a metal guide. The guide I used is a small piece of copper tubing. The inside diameter of this tubing is



slightly smaller than the $\frac{1}{8}$ " bit used to drill the pilot hole. But that's okay. It's easy to ream out the copper tubing once it's installed in the fence.

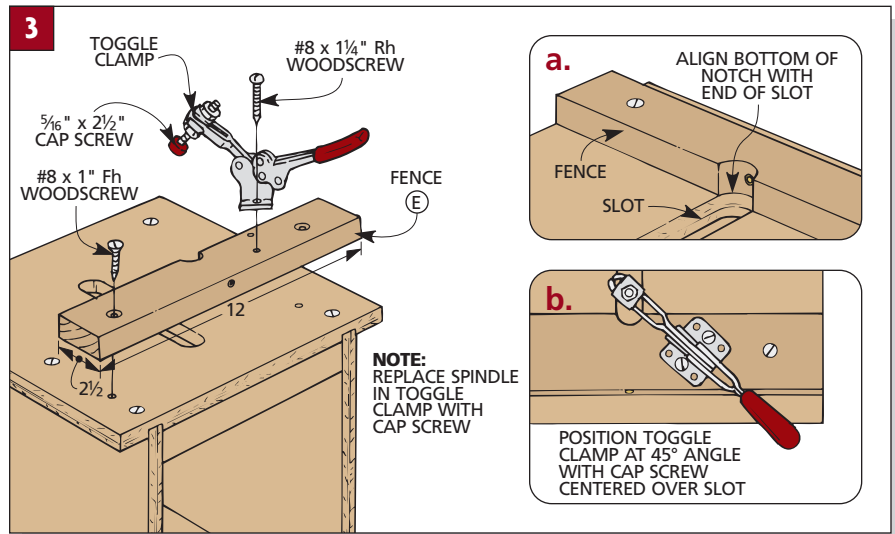
The tubing fits into an angled hole in the fence. To drill this hole, you could tilt the metal table on your drill press. But that would involve too much fiddling around and it's hard to set it exactly.

So instead of adjusting the angle of the table, I tilted the workpiece instead. To do this, start by ripping a 5° bevel on the edge of the fence that's opposite the notch (Figs. 4 and 4a). With the beveled edge resting on the table, it's easy to drill the hole at the correct angle.

Now you're ready to install the tubing. It's best to cut a piece about $\frac{1}{8}$ " longer than needed. Then tap it into the hole until the end of the tubing sticks up about $\frac{1}{4}$ " (Fig. 5). At this point, apply "instant" glue to the tubing and tap it in the rest of the way. Then file and sand the exposed end so it's flush with the fence.

ATTACH FENCE. Once the guide tubing is installed, you can attach the fence to the Pocket Hole Jig. It's screwed in place so the bottom of the notch aligns with the end of the slot (Fig. 3a).

REAM TUBING. Now that the fence is attached, you can ream out the tubing (Fig. 6). I used a $\frac{1}{8}$ " twist bit to do this. But a standard length bit is too short to extend all the way through the tubing.



So I used a 6"-long bit that I picked up at a local hardware store.

Note: This is the same bit that will be used later to drill the pilot holes.

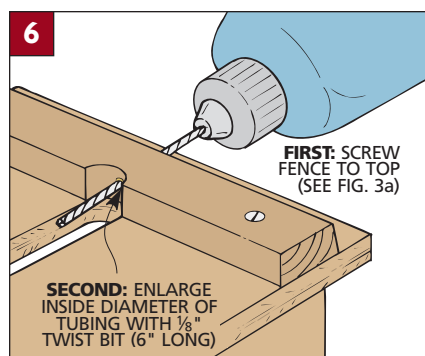
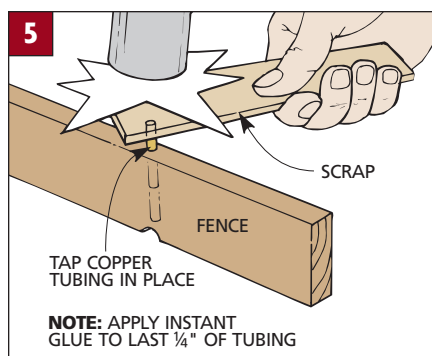
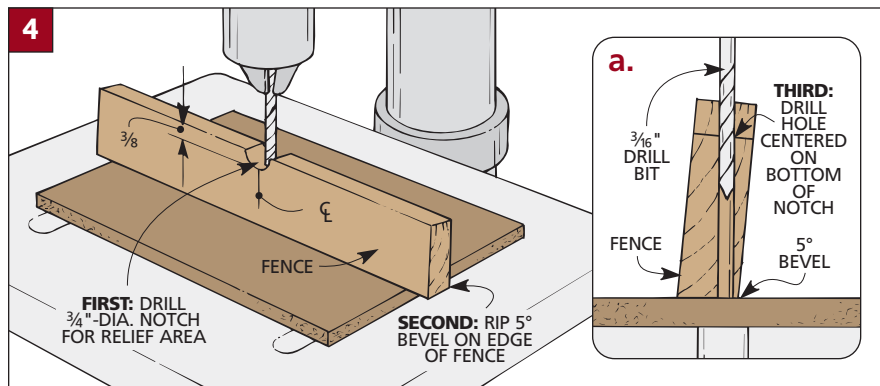
TOGGLE CLAMP. All that's left to complete the fence is to add a toggle clamp (Fig. 3). (See Sources, page 126.) It holds the workpiece securely in place as you make a cut. The nice thing about this type of clamp is it provides a quick way to clamp (and unclamp) the workpiece.

But there was one drawback to the clamp I chose. It had a rubber tip on the end of the spindle that allowed the workpiece to shift as I routed the pocket. So I

replaced the spindle with a cap screw (Fig. 3). Then I used liquid plastic to keep it from denting my workpiece (see the Shop Tip below).

After installing the cap screw, you can attach the clamp to the fence. Position it so the head of the cap screw is centered over the slot in the top (Fig. 3b). This way, the clamp will apply pressure directly over the router bit.

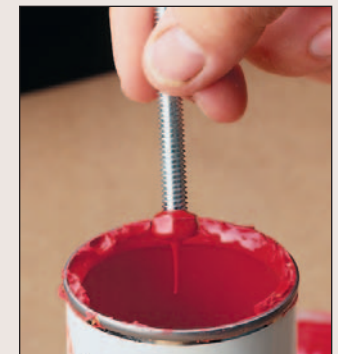
One more thing. It's best to position the base of the clamp at an angle and to set it to the side of the notch. This way, the handle doesn't get in the way of the drill when you drill the pilot hole.



SHOP TIP

Liquid Plastic

The rubber tip on the clamp was replaced with a cap screw. To prevent the screw head from denting the workpiece, I filed it flat and dipped it several times in liquid plastic to build up a "pad."



ROUTER CARRIAGE

Once you finish building the base and fence, complete the Pocket Hole Jig by building the carriage. The heart of the jig is a pivoting carriage that holds the router securely in place (*Fig. 7*). As you tilt this carriage forward, the router bit cuts the pocket in the workpiece.

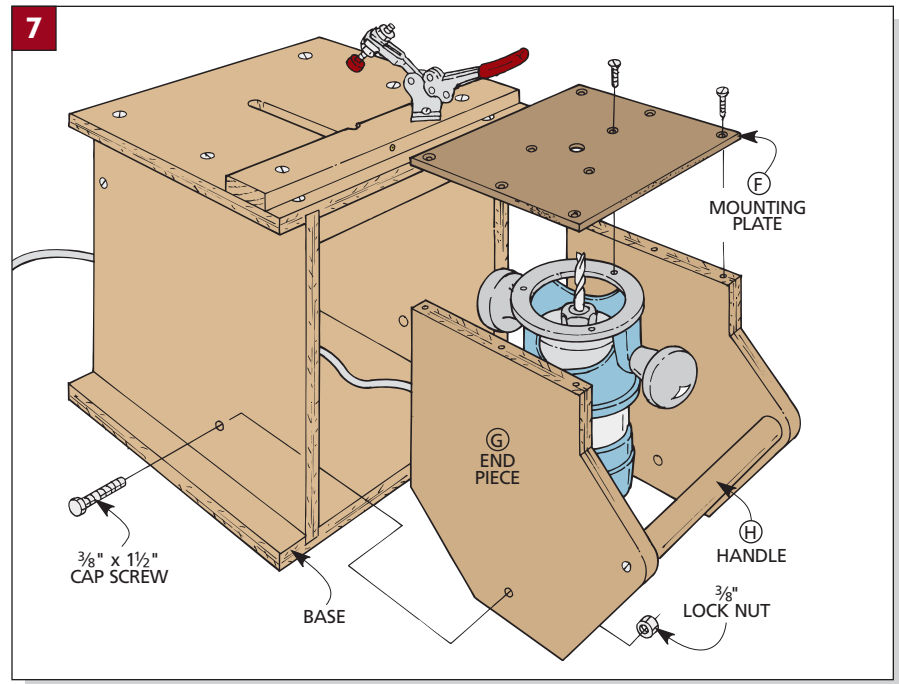
To produce a smooth cut, the goal is to create a friction fit between the carriage and the base. Basically, this is a matter of “feel.” When you pull the carriage forward, it should barely brush against the sides of the base.

MOUNTING PLATE. Getting the right fit depends on the size of the mounting plate (F) that’s used to secure the router in the carriage (*Fig. 7*). This is just a piece of $\frac{1}{4}$ " hardboard that’s cut to size to produce a sliding fit.

The mounting plate replaces the base on your router. So you’ll need to transfer the mounting holes from the router base to the mounting plate (*Fig. 8a*).

There are a couple of things to keep in mind here. First, be sure to locate the holes so the handles of the router aren’t wedged against the end pieces (added later) (*Fig. 7*). And second, you’ll want to be sure to have easy access to the on and off switch on the router.

After drilling countersunk holes for the mounting screws, there’s one more

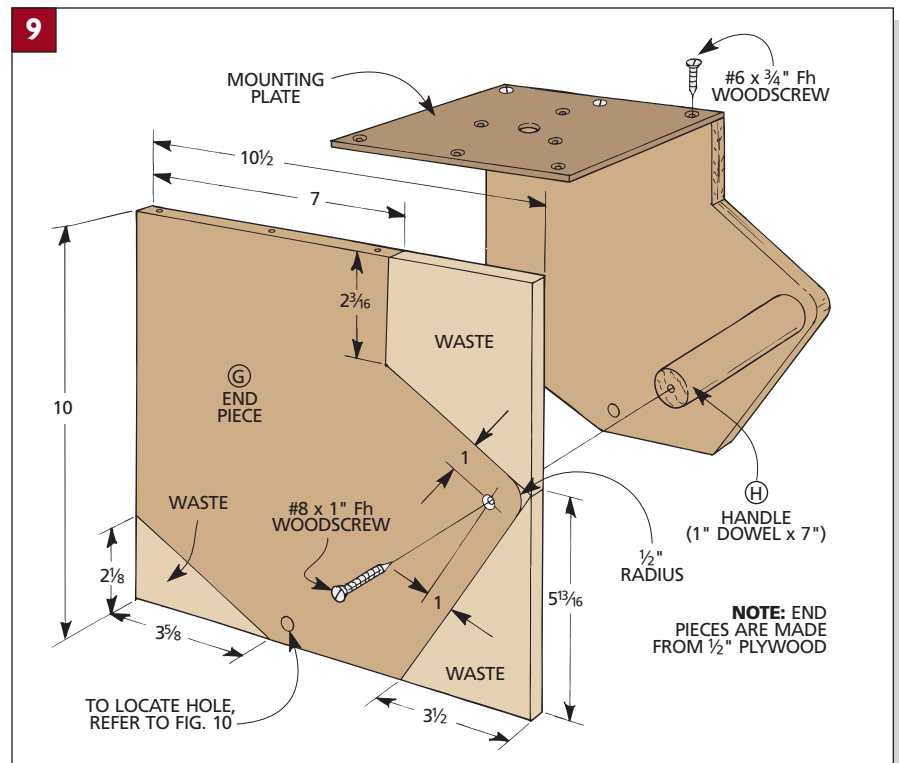
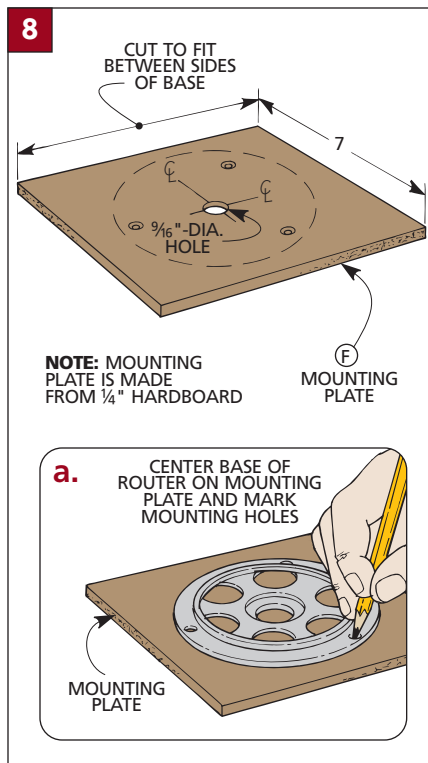


thing to do. That’s to drill a centered hole that allows the router bit to stick up through the mounting plate. Once it’s been drilled you can start on the ends.

END PIECES. The next step is to add two plywood end pieces (G) to support the mounting plate and router (*Fig. 9*). There is one unusual thing about these end pieces — their shape.

There’s an angled notch in the upper corner of each end piece. As you tilt the pivoting carriage forward, the vertical part of this notch contacts the stop (C) on the base. This establishes the end of the pocket in the workpiece.

Both of the bottom corners on the end pieces are cut at an angle as well. To allow the carriage to pivot near the bottom of



the base, there's an angled corner in back. And the one in front gives the carriage a slimmer profile.

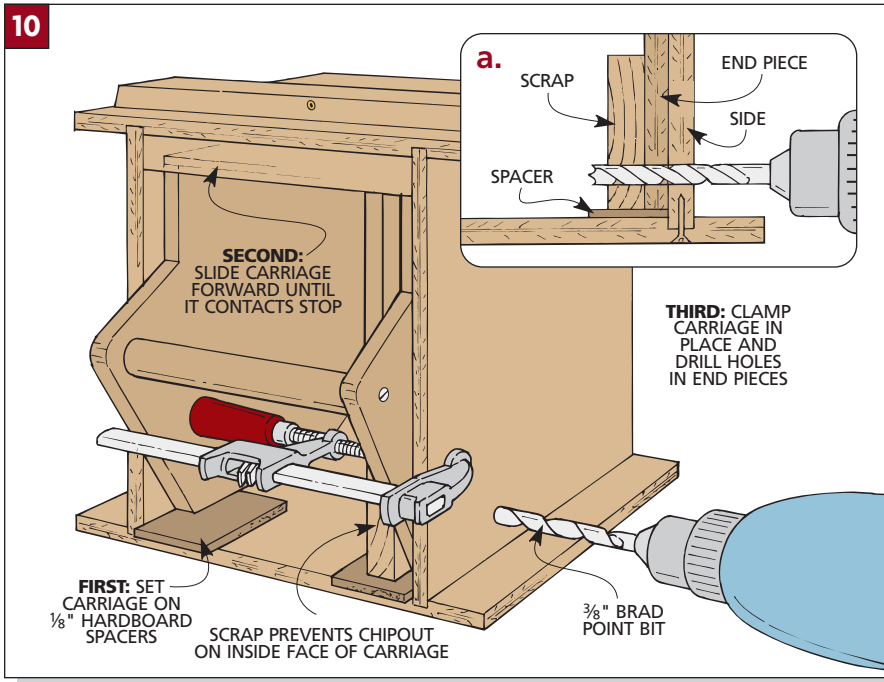
Since the end pieces work together, both of them need to be identical. An easy way to accomplish this is to stick the two blanks together with carpet tape. Then cut and sand the pieces to shape. It's also a good idea to sand a radius on the sharp corner in front.

HANDLE. After screwing the mounting plate to the end pieces, I added a handle (H) (Fig. 9). It's nothing more than a dowel that's cut to fit, and screwed between the end pieces.

PIVOT HOLES. At this point, you're just about ready to install the router carriage. But first, you'll need to drill holes in the end pieces for the two $\frac{3}{8}$ " cap screws that act as pivot points (Fig. 7).

To locate these holes, start by slipping the carriage into the base and setting it on a couple of $\frac{1}{8}$ "-thick spacers (Figs. 10 and 10a). These spacers raise the carriage up just a bit so it won't bind.

Now slide the pivoting carriage forward until it contacts the stop. After



clamping the carriage in place, you can use the holes in the base as a guide to drill the holes in the end pieces.

Note: Clamping a piece of scrap against the carriage prevents excess chipout on the inside face.

SHOP INFO

Pocket Hole Screws

It's not hard to create strong pocket hole joints that assemble easily, when you use special "pocket hole" screws. These screws are slightly different from regular woodscrews.

SELF-TAPPING. A pocket hole screw has a self-tapping "auger" point that drills into a workpiece. This point prevents the back piece of the joint (the one without the pilot hole) from splitting.

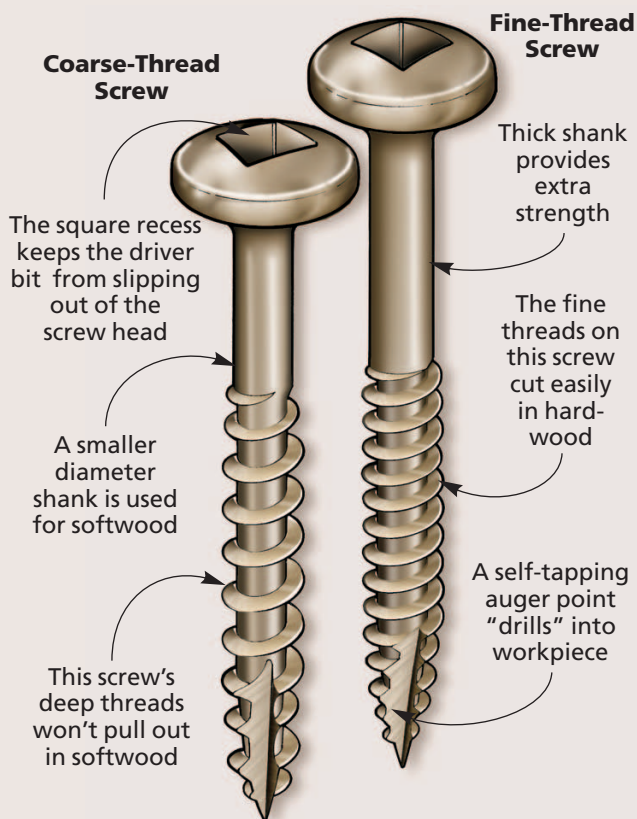
THREADS. Because the screws are self-tapping, you'll want to match the threads with the type of material you're using. To provide a secure grip in different types of materials, the screws are available with two kinds of threads — coarse-thread and fine-thread. Deep threads on the coarse-thread screw keep it from pulling out of softwoods and plywoods (left in drawing).

But you'll need a screw with fine threads to "bite" into hardwoods (right in drawing). The screws with fine threads have a shallow pitch so the screw drives in a bit slower than the coarse-thread screws tend to. This way, the screw will be less likely to break when being driven into a hard piece of maple.

Note: Fine-thread pocket hole screws also have a thicker shank to provide a little extra strength.

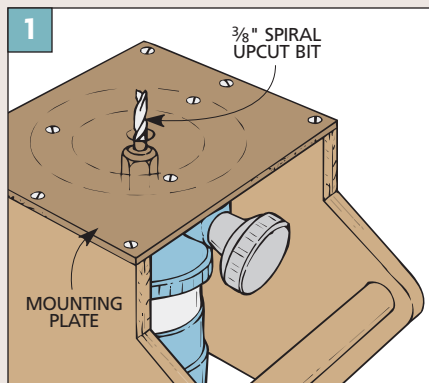
Breaking screws is a little less of a concern for softwoods, so a coarse-thread screw is more aggressive and drives in noticeably faster. However, with softer woods, like cedar, you need to watch that you don't drive the screws in too far. This is a real possibility — even with the square shoulder of the counterbore and the panhead on the screw (see drawing).

SQUARE RECESS. Finally, a square recess in the head will keep the driver bit from slipping out as you install the screw. (For sources of pocket hole screws, see page 126.)



The Pocket Hole Jig only takes a few minutes to set up. Basically, it's just a matter of mounting a bit in the router and then installing the carriage.

SPIRAL BIT. The router bit I use is called a spiral upcut bit (*Fig. 1*). A spiral upcut bit produces a shearing type of cut that results in a smooth, clean pocket. (For more information about these router bits, refer to the left photo on the next page.)



DEPTH OF CUT. After mounting the bit in the router, you'll need to adjust it for the correct depth of cut. The goal is to create a 1/2"-deep pocket at the end of the cut. This creates a solid "seat" for the head of the pocket hole screw.

To accomplish this, the bit needs to stick up 1/2" above the base after the carriage is installed (*Fig. 2a*). In my case, this meant adjusting the height of the bit so it projected 1 5/8" above the router mounting plate (*Fig. 2a*).

INSTALL CARRIAGE. Once the bit is adjusted, you're ready to fit the carriage inside the base. This looks like a tight squeeze. But if you tip the top of the carriage under the stop, it slides right in (*Fig. 2*). Then simply secure the carriage with the two cap screws and lock nuts.

SUPPLIES. Before routing the pockets, round up the supplies you'll need to assemble the joint. To get good results, it's worth getting screws that are specially designed for pocket hole joints.

(For more on these screws, see Shop Info on page 83.) And you'll need a long twist bit and driver bit to install the screws (see right photo on the opposite page).

USING THE JIG

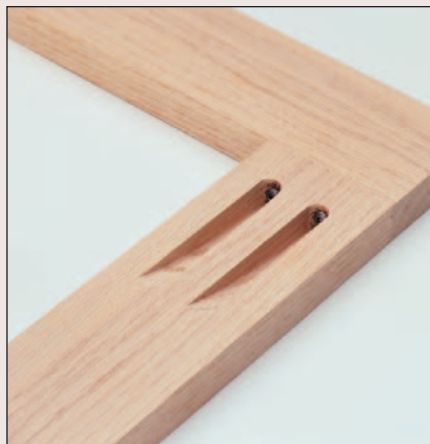
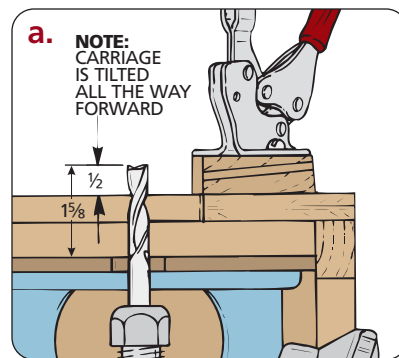
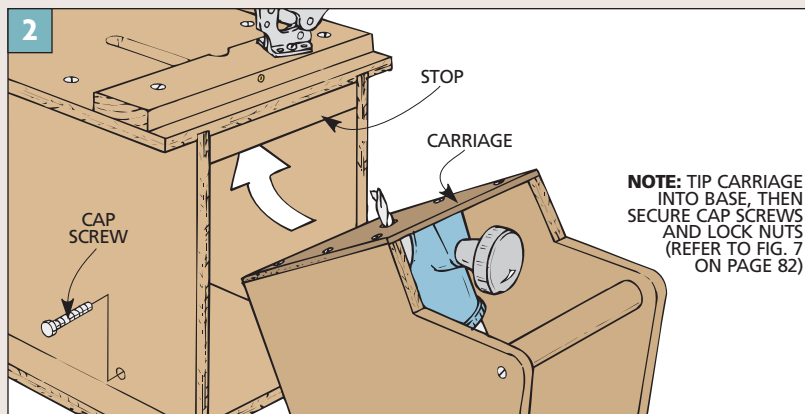
With supplies in hand, you're ready to start making some pocket hole joints.

CUT PIECES TO LENGTH. One of the advantages of a pocket hole joint is that the pieces are simply butted together. Start by cutting each piece to final length.

LAYOUT. Also, keep in mind that you rout the pocket and drill the pilot hole in one piece only. This means you only have to lay out the joint on that one piece.

With the workpiece lying flat on the Pocket Hole Jig, the pocket will be routed on the bottom side. So mark the location of the pocket on the top side where you can more easily see it.

REFERENCE MARK. But the layout line won't show you where to position the



Face Frames. If you're building a face frame, the Pocket Hole Jig makes quick work of joining the rails and stiles.



Cabinets. The jig also makes it easy to cut the pockets and drill the pilot holes that are used to assemble this cabinet.



Furniture. After using the jig to cut the pockets in the base of this table, installing screws provides plenty of strength.

workpiece on the jig. To do that, you'll need to draw a reference mark centered on the length of the fence (*Step 1* below). This mark indicates the path of the router bit. So, to cut the pocket exactly where you want it, just align the mark with the layout line on the workpiece.

ROUT POCKET. After clamping the workpiece in place, you're ready to rout the pocket (*Step 2*). The pocket gets progressively deeper, which means you'll be removing quite a bit of material. So give the router bit a chance to cut by slowly pulling the carriage forward.

PILOT HOLE. Once the pocket is complete, the next step is to drill the pilot hole (*Step 3*). There's no need to unclamp the workpiece. The guide will automatically center the drill bit on the pocket. And don't worry about the depth of the hole. You'll feel the bit "give" just a little as it breaks into the pocket.



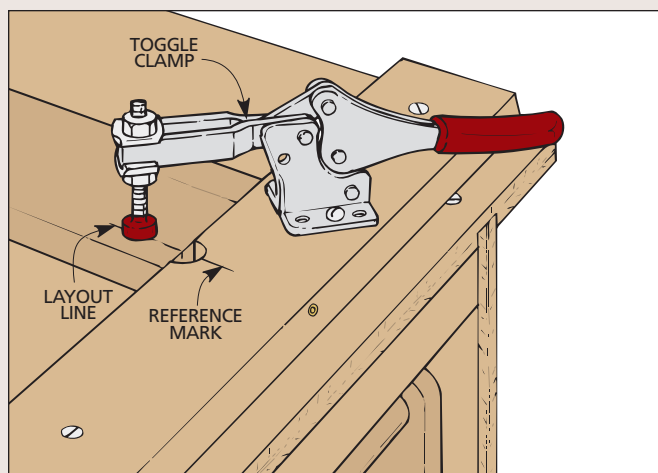
Spiral Upcut Bit. Designed to cut in two different directions, a spiral upcut bit is the best choice for the Pocket Hole Jig. It produces a smooth, clean cut with little effort.



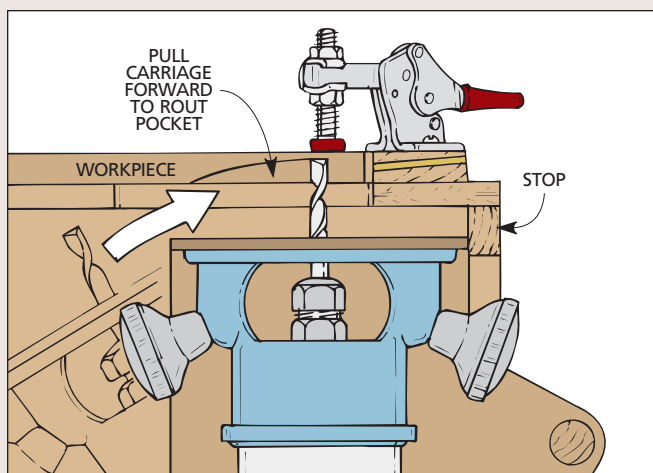
Drill and Drive. To drill the guide hole, I used a 1/8" twist bit (top) that's 6" long. A 6"-long square-tipped driver bit (bottom) makes it easy to install the screws.

ASSEMBLY. Now it's just a matter of assembling the joint (*Step 4*). To ensure that the joint ends up flush in front, clear enough space on a workbench, so you can place the workpieces on a flat surface with their "good" sides face down.

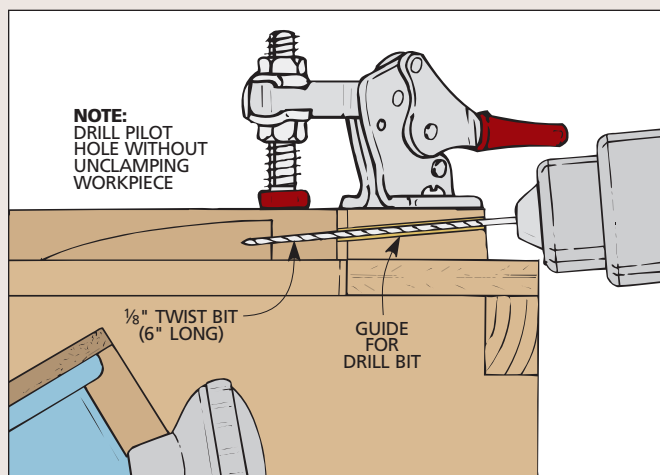
Before installing the screws, don't forget to apply some yellow glue to the mating surfaces of the joint. Then just clamp the back piece to the worksurface. This will keep the joint nice and tight as you drive in the screws.



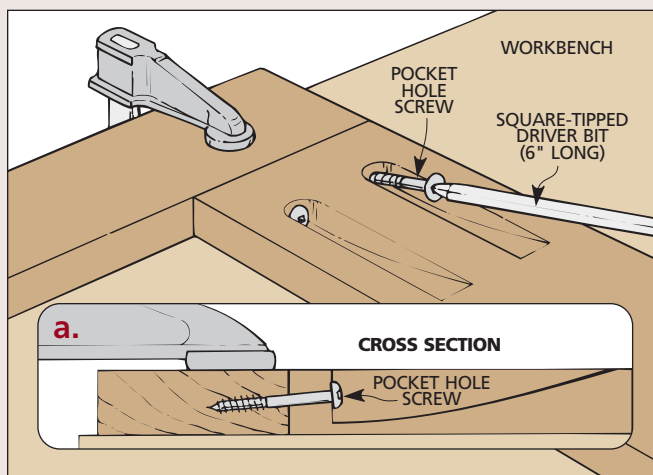
1 Start by marking a layout line on the workpiece. Align this layout line with the reference mark on the fence. At this point, you can butt the piece against the fence and clamp it in place.



2 After turning the router on, slowly pull the router carriage forward until it stops. As the carriage pivots, the router bit scoops out a 1/2"-deep pocket in the workpiece.



3 There's no need to unclamp the workpiece to drill the pilot hole. The guide for the extra-long drill bit in the fence will automatically center the twist bit on the pocket.



4 To assemble the joint, place both workpieces on a flat surface. Then clamp the back piece (the one without the pocket holes) in place and use a long driver bit to install the screws.



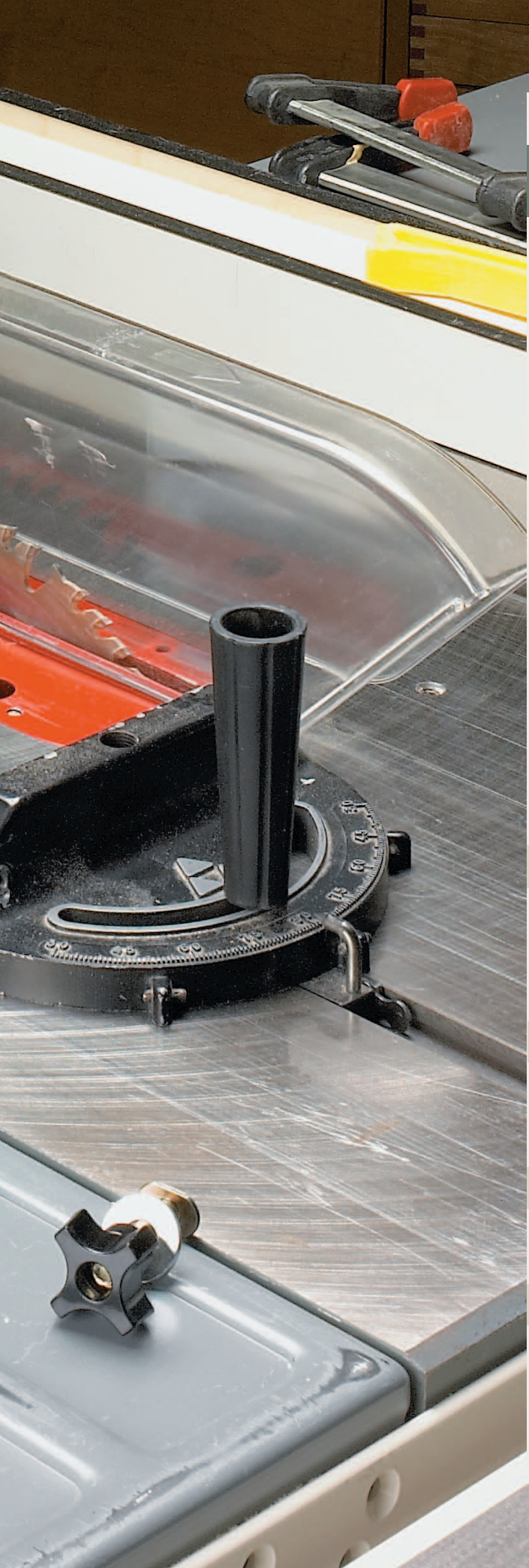


TABLE SAW

Centerstage in just about every shop is the table saw. It's the "workhorse" because almost every project requires a rip, crosscut, miter, bevel, dado, or groove.

But how can you make this tool even better? Start with these projects that will make time spent at the table saw safer and more productive, and will give you better results.

Since the saw is in the middle of the action, it just makes sense to turn it into a multi-purpose workstation. Ours is anchored by three storage cabinets with drawers to organize accessories. The cabinets also serve as the base for a router table in the extension wing. Casters make everything mobile, and an outfeed table completes the upgrade.

Smaller upgrades can also improve your saw's performance. An auxiliary miter gauge fence provides support for longer workpieces. A couple of stops make repeat cuts quick and accurate. And you can get dead-on 45° miters without any fussing or fine-tuning by building our simple miter jig. Finally, the T-tracks built into the auxiliary rip fence let you attach a featherboard, a push block, or other accessories.

Miter Gauge Fence

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Table Saw Workstation

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Miter Gauge Fence

Stop searching for a piece of scrap to use as an auxiliary fence. This adjustable Miter Gauge Fence provides a true, flat face, two built-in stops, plus a tape measure so you can set up cuts quickly.



One of the simplest accessories you can add to the miter gauge on your table saw is an auxiliary fence. It provides more support for a workpiece than the miter gauge by itself. Plus you can clamp a stop to the fence to make accurate repeat cuts.

So how do you improve on such a good thing? Two ways.

First, make it adjustable from side to side. This way, when you tilt the head of the miter gauge to make an angled cut, the fence can be repositioned quickly to provide support up close to the saw blade.

The second improvement is to add a couple of stops. Ideally, these stops could

be set up quickly and accurately without having to fiddle with clamps.

T-TRACK. As it turns out, I had just the right thing to make these improvements work — T-track. T-track is just a strip of extruded aluminum with a slot that holds a T-shaped bolt. (See the Shop Info box on page 94 and Sources on page 126.)

ADJUSTABLE FENCE. With the T-track in hand, I set about making a better Miter Gauge Fence. It provides support to prevent a board from twisting during a cut. But it's the two improvements I mentioned that set this fence apart.

For example, a strip of T-track in the back of the fence makes it adjustable.

Loosening two lock knobs lets you slide the fence from side to side.

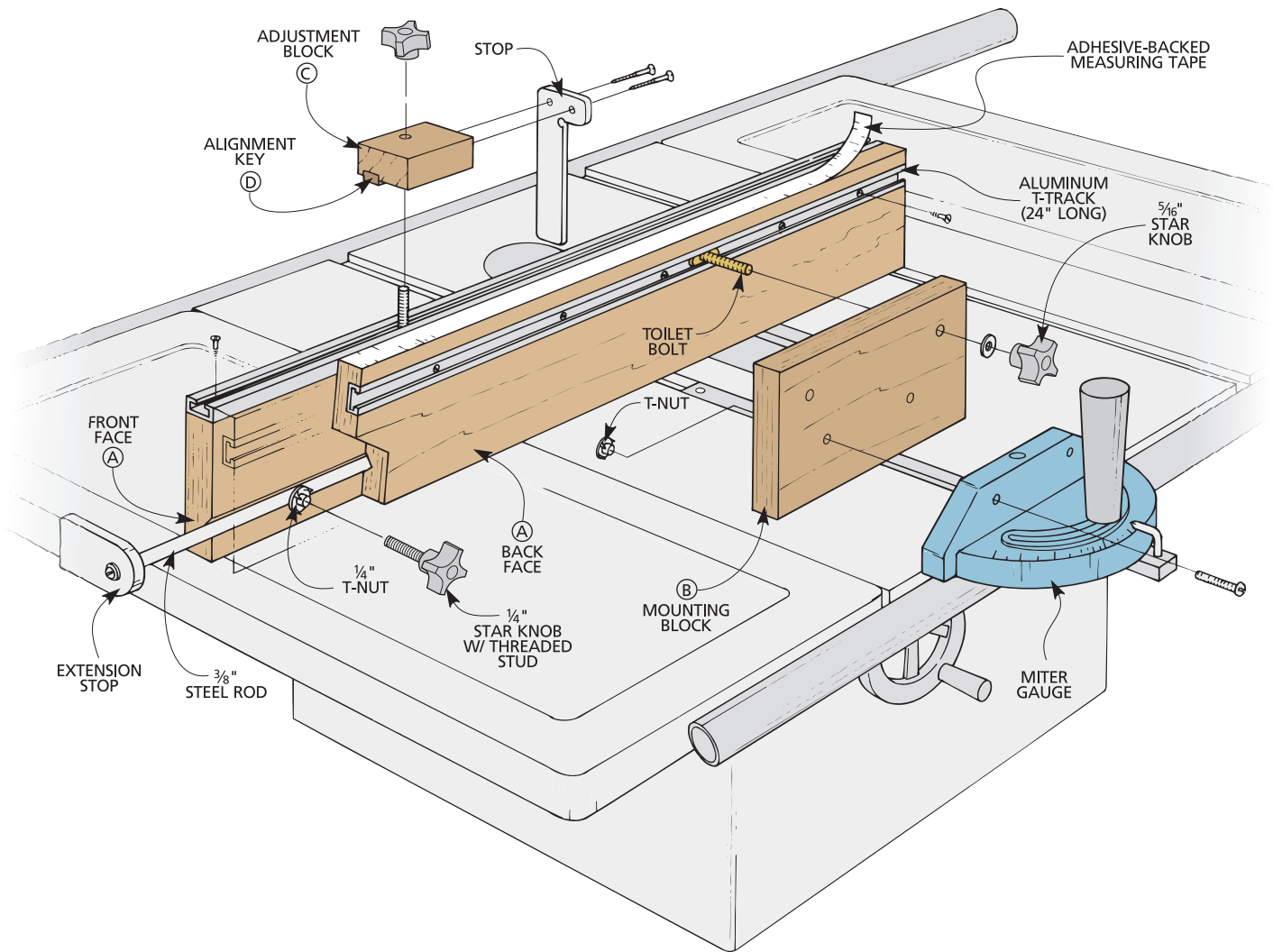
STOP BLOCK. The second strip of T-track is attached to the top of the fence. This strip acts as a guide for an adjustable stop block. This stop block makes it quick and easy to crosscut multiple workpieces to identical length. One thing to note here is the L-shaped, metal stop. To prevent the stop from flexing, it's made from a thick aluminum plate.

EXTENSION STOP. There's also a metal stop that extends out from the body of the fence. When working with long pieces (up to 41½" long), this stop provides a quick, accurate way to cut them to length.

EXPLODED VIEW

OVERALL DIMENSIONS:

24 $\frac{1}{4}$ "W x 3 $\frac{7}{8}$ "D x 5 $\frac{1}{4}$ "H



MATERIALS LIST

WOOD

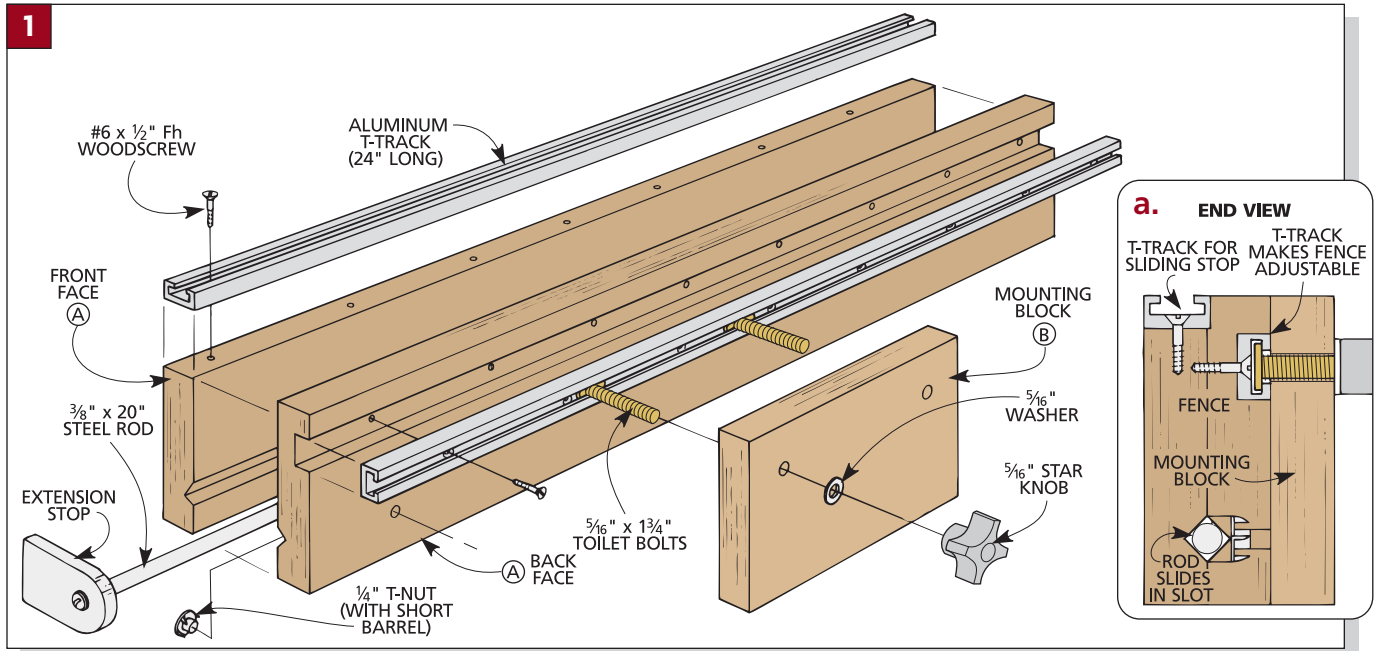
- A** Front/Back Faces (2) $\frac{3}{4}$ ply - 3 $\frac{1}{2}$ x 24
- B** Mounting Block (1) $\frac{3}{4}$ ply - 3 $\frac{1}{2}$ x 7 $\frac{1}{4}$
- C** Adjustment Block (1) $\frac{3}{4}$ x 1 $\frac{1}{2}$ - 2
- D** Alignment Key (1) $\frac{1}{4}$ hdbd. - $\frac{3}{8}$ x 2

HARDWARE SUPPLIES

- (14) No. 6 x $\frac{1}{2}$ " Fh woodscrews
- (2) No. 8 x 1" Fh woodscrews
- (1) 8-32 x $\frac{1}{2}$ " Rh machine screw
- (2) 24"-long aluminum T-tracks
- (3) $\frac{1}{4}$ " T-nuts w/ short barrels

- (1) $\frac{3}{8}$ " x 20" zinc-plated steel rod
- (1) No. 8 flat washer
- (1) $\frac{1}{4}$ " star knob w/ $\frac{3}{4}$ "-long threaded stud
- (1) 3" x 5" aluminum plate ($\frac{1}{4}$ " thick)
- (1) Self-adhesive measuring tape (right to left)
- (3) $\frac{5}{16}$ " x 1 $\frac{3}{4}$ " toilet bolts
- (3) $\frac{5}{16}$ " flat washers
- (3) $\frac{5}{16}$ " star knobs w/ through hole
- (2) Rh machine screws (sized to fit) for mounting jig to miter gauge

1



FENCE

The main job of this auxiliary fence is simple — it provides support for a workpiece as you push it through the table saw blade. But this fence offers a few more interesting features.

FEATURES. To make the Miter Gauge Fence adjustable, there's a strip of T-track in the back of the fence. A second strip on top of the fence serves as a track for an adjustable stop. Finally, there's a sturdy "extension" stop attached to a

sliding metal rod. It's used when cutting longer stock to length (*Fig. 1*). To further increase the performance of the fence, see the Designer's Notebook on page 93.

TWO FACES. To create a slot that allows the extension stop rod to slide in and out, the fence is made up of a front and back face (*Fig. 2*). I used $\frac{3}{4}$ " Baltic birch plywood for both faces.

V-GROOVE SLOT. After cutting the faces to size, the next step is to make the slot for the stop rod. It's formed by two V-shaped grooves, one in the inside face of

each fence piece. The goal is to get the rod to fit snugly inside the slot, yet still slide easily. The best way I found to accomplish that is to use a table-mounted router with a V-groove bit and "sneak up" on the perfect fit.

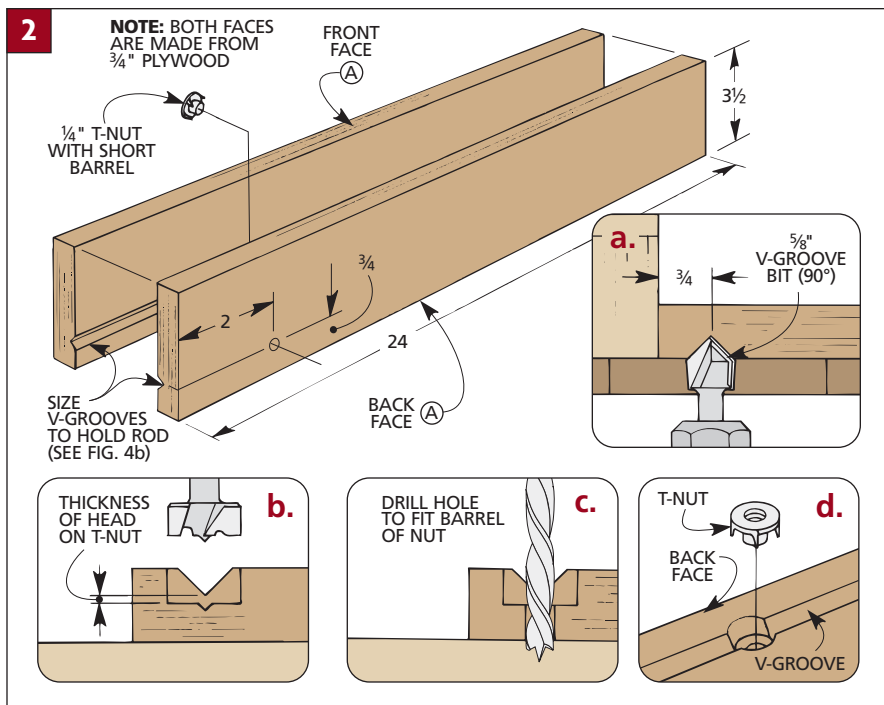
To do this, start by setting the fence $\frac{3}{4}$ " away from the tip of the bit (*Fig. 2a*). Then adjust the height of the bit to make a shallow cut (about $\frac{3}{16}$ " deep). After routing both halves of the fence, clamp the pieces together and check the fit of the rod. If necessary, raise the bit just a hair and rout each piece again. Continue like this until the rod slips in and out with a smooth, sliding fit.

T-NUT. Once you're satisfied with the fit, the next thing to do is to install a T-nut in the back face of the fence (*Figs. 2 and 2d*). Later, the T-nut accepts a knob that locks the rod in place.

The head of the T-nut fits in a counterbored hole centered on the width of the V-groove (*Fig. 2b*). The thing to be aware of is the depth of this hole. To prevent the rod from hitting the T-nut, drill the hole deep enough to recess the head below the groove. Now just drill a shank hole (*Fig. 2c*) and install the T-nut.

GLUE-UP. At this point, you're ready to glue up the the front and back faces that make up the fence. All that's needed here is a thin film of glue. If glue squeezes into the grooves, it will be hard to remove from the slot. Plus, any dried glue could cause the rod to bind. When clamping the fence together, the pieces may slip out of alignment. So be sure to check that

2



they're flush all around and make any adjustments before the glue dries.

T-TRACK. Once the fence faces are glued up, you can turn your attention to the two strips of aluminum T-track. They're simply cut to length to match the length of the fence.

One of the strips of aluminum T-track fits in a groove in the back of the fence (Fig. 1). The other strip sits in a rabbet in the fence's top edge.

A dado blade mounted in the table saw makes quick work of cutting the groove (Fig. 3a). I sized the groove so the track will sit flush with the fence.

The next step is to cut the rabbet. It's best to do this with the wide part of the fence lying face down on the table saw (Fig. 3). (This supports the workpiece better than standing it on edge.)

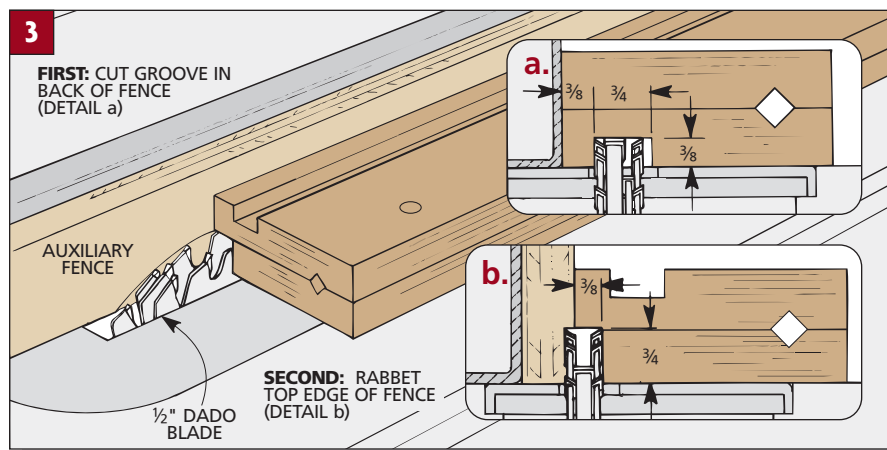
One other thing. The rabbet is cut with the fence up close to the blade. So to avoid cutting into the rip fence, you'll need to "bury" part of the blade in an auxiliary rip fence (Fig. 3b).

Note: I adjusted the auxiliary fence to make a $\frac{3}{8}$ "-wide cut.

Now, to make the cut, just turn on the table saw and guide the workpiece over the blade with a push block.

MOUNT FENCE. To complete the fence, screw the two pieces of T-track in place and then mount the fence to the miter gauge. Actually, the fence isn't attached directly to the miter gauge. Instead, it's fastened to a small $\frac{3}{4}$ " plywood mounting block (B) that's secured to the miter gauge (Figs. 4 and 4b).

To make the fence adjustable, there are two toilet bolts that slide in the T-track in back of the fence. These bolts



pass through holes in the mounting block. Adjusting a knob on each bolt allows you to slide the fence along the mounting block (or lock it in place).

A couple of T-nuts in the mounting block accept machine screws that secure the block to the miter gauge (Fig. 4b). To allow the fence to fit tightly against the mounting block, the head of each T-nut is recessed slightly.

This recess is formed by drilling a counterbore in the block. The problem is finding the centerpoint of this counterbore. That's because it's in the side of the mounting block that's opposite the side that fits against the miter gauge.

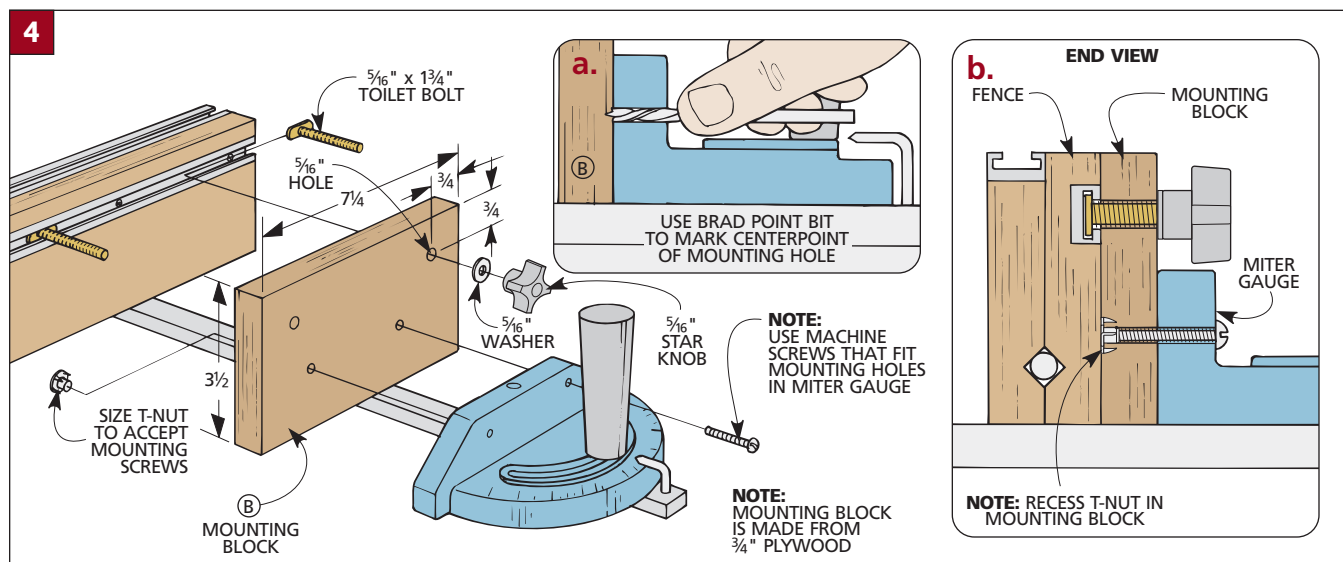
To do this, use the existing holes in the miter gauge to mark the centerpoints on one side with a brad point bit (Fig. 4a). Then drill small ($\frac{1}{16}$ ") pilot holes. The points where the bit cuts through establish the centerpoints on the opposite side.

Now you can drill the counterbored shank holes and add the T-nuts.

SHOP TIP

Dowel Set

The head of my hammer is too big to fit down into the counterbored pocket that holds the T-nut in the back fence. So I installed the T-nut by tapping a short piece of dowel against the head.



STOP BLOCK

One of the handiest things about this Miter Gauge Fence is the adjustable stop (*Fig. 5*). When you need to crosscut a piece to length (or make multiple cuts), this stop block is quick and easy to set up and it ensures accurate results.

NO MEASURING. One nice thing about setting up this stop block is there's no need to measure. That's because there's a measuring tape attached to the top of the fence. To set up a cut, simply slide the stop block until it aligns with the desired mark on the measuring tape. Then tighten a knob to lock it in place.

The stop block consists of two main parts: a wood block that slides along the T-track in the top edge of the fence and a metal, L-shaped stop.

SLIDING BLOCK

I began by making the sliding block. It's made up of two separate pieces: an adjustment block and an alignment key.

ADJUSTMENT BLOCK. The adjustment block (C) is a small piece of $\frac{3}{4}$ "-thick hardwood that provides a mounting surface for the stop (*Fig. 5*). (I used maple.)

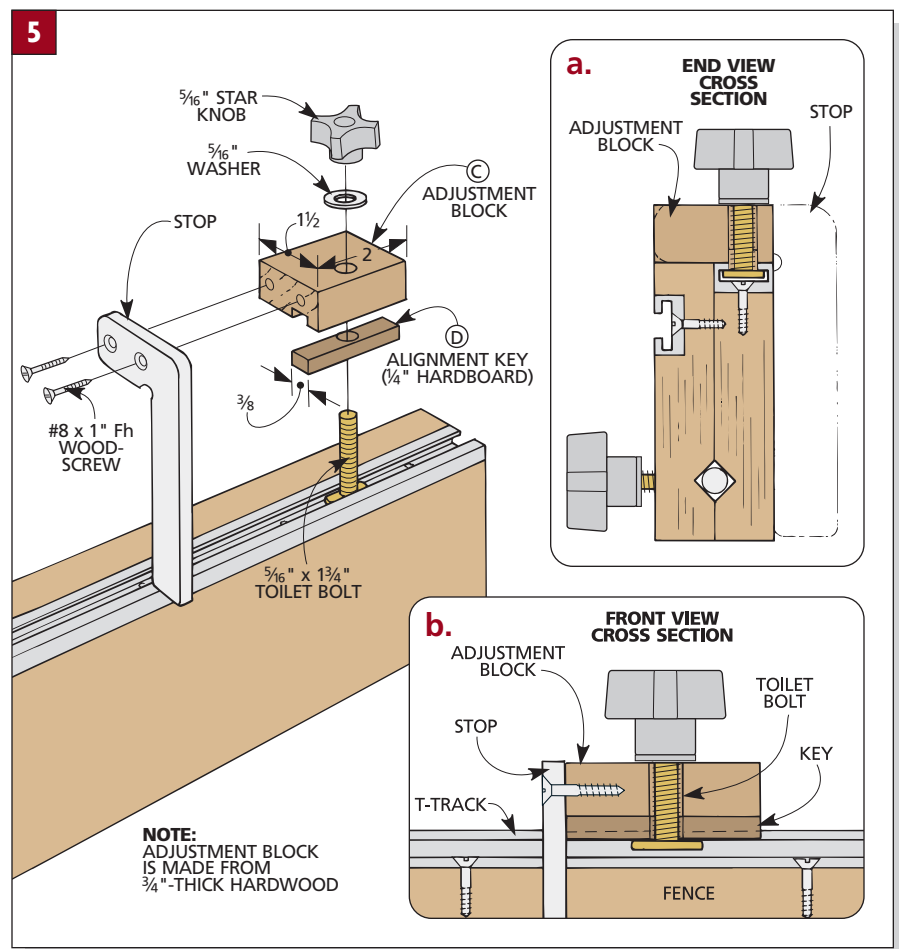
Notice that there is a shallow groove in the bottom of this block that holds an alignment key (added later). Since the adjustment block is fairly small, it's safest to cut this groove in an extra-long workpiece that's ripped to width (*Fig. 6*).

It only takes a minute to set up the table saw to cut the groove. Start by positioning the rip fence $\frac{3}{16}$ " away from the saw blade (*Fig. 6a*). Then, after locking the fence in place, adjust the height of the blade to make a $\frac{3}{16}$ "-deep cut.

Now just turn on the saw, set the workpiece against the fence, and push it across the blade with a block. To remove the rest of the waste, you'll need to make a couple more passes, nudging the fence away from the blade between each pass.

ALIGNMENT KEY. After trimming the adjustment block to length, the next step is to add the alignment key (D). It's a short strip of $\frac{1}{4}$ " hardboard that fits into the groove in the adjustment block. In use, the key fits down into the slot in the T-track and prevents the stop from twisting as you slide it back and forth.

After gluing the alignment key in the groove, the next step is to provide a way to lock the stop block at the desired location on the track. This is accomplished with a toilet bolt and knob.



The head of the toilet bolt slips into the T-track while the shank passes through a hole in the adjustment block (*Figs. 5a and 5b*). By threading a knob on the bolt, it pinches the head against the T-track, which clamps the stop block in place.

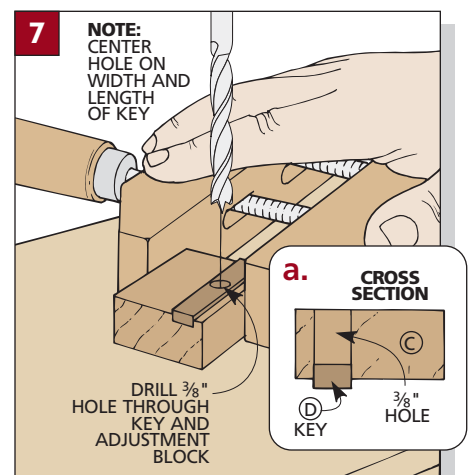
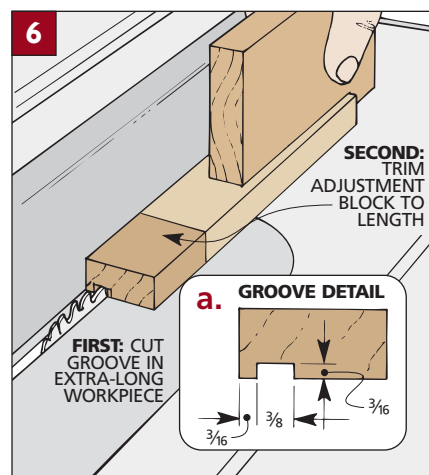
The hole that accepts the toilet bolt is slightly oversize ($\frac{3}{8}$ " dia.) (*Fig. 7a*). This will provide a small amount of "play" in the bolt — just enough to allow the stop block to slide easily in the track.

Note: I clamped the adjustment block in a handscrew to hold it steady while drilling the hole (*Fig. 7*).

STOP

With the sliding block complete, the next step is to add the L-shaped stop that hangs in front of the fence.

To produce accurate results, I wanted to make sure the stop didn't flex when I



butted the end of a board against it. But I didn't want a large, bulky stop either.

ALUMINUM PLATE. After checking around a bit, I found the ideal material to make a rigid, compact stop — a $\frac{1}{4}$ "-thick plate of solid aluminum. It doesn't take a large piece of aluminum to provide enough material for both the adjustable stop and the extension stop. I bought a 3" x 5" plate from a machine shop.

LAY OUT SHAPE. Start by laying out the stops (refer to *Fig. 8* and *Fig. 10* on page 95). Since pencil lines can rub off, I used a fine-tipped, permanent marker.

LOCATE HOLES. You'll also want to mark the centerpoints of the mounting holes. Also mark the "stress relief" hole in the inside corner of the arm.

DRILL HOLES. Since aluminum is fairly "soft," drilling the holes should go quickly. Just be sure to make a dimple with a punch first to prevent the tip of the bit from skidding across the plate. Also, don't forget to clamp the plate securely to the drill press table — you don't want it spinning around as you drill the holes.

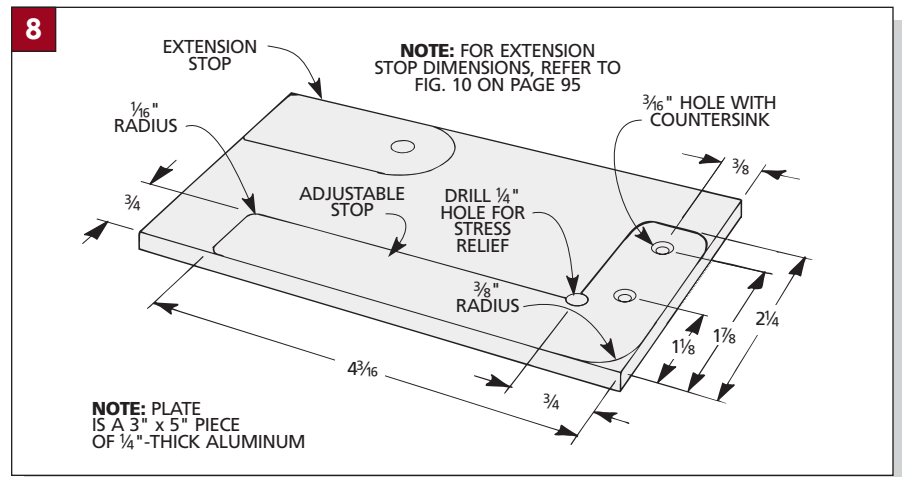
CUT TO SHAPE. The next step is to cut the two stops to rough shape. Then, after

tightening the plate in a vise, a hack saw is all that's needed here. To minimize the amount of clean-up, try to cut about $\frac{1}{16}$ " to the waste side of the lines. The remaining material can be quickly removed with a disc sander (or a file). I also sanded a gentle radius on the corners to "ease" the sharp edges (*Fig. 8*).

SAND THE SIDES. If the sides of the aluminum stop are scratched or dirty, you may want to sand them as well. I attached

strips of aluminum oxide sandpaper (120 up to 300 grit) to a flat surface and then "scrubbed" the stops back and forth to produce a smooth, satin finish.

ASSEMBLY. Now it's just a matter of assembling the stop block. After drilling a couple of pilot holes in the adjustment block, the stop is simply screwed in place. Then slide the toilet bolt into the T-track, slip the stop block over it, and thread on the knob (*Fig. 5*).



DESIGNER'S NOTEBOOK

A hardboard insert adds versatility to the adjustable fence.

CONSTRUCTION NOTES:

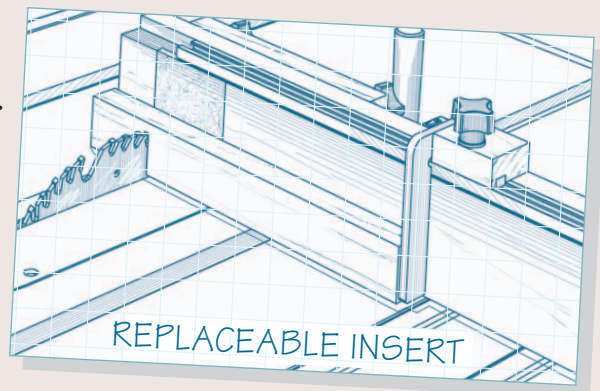
- To reduce chipout, you could add a hardboard insert to the Miter Gauge Fence. A sliding dovetail design allows you to easily replace the insert when it's chewed up (see drawing).
- To accommodate the insert, make the front and back faces (A) 27" long.
- Then, to make it replaceable, the insert fits into a dovetail-shaped recess at the end of the fence (detail 'a').
- The outside edges of the recess are cut with a dovetail bit in the router table (detail 'a'). Then switch to a $\frac{1}{2}$ " straight bit to remove the waste material.
- To make the insert, start with a long strip of hardboard that's about $\frac{1}{4}$ " wider than needed. Then use the same dovetail

bit to bevel both edges of the strip. And sneak up on the final width so you can create a smooth, sliding fit.

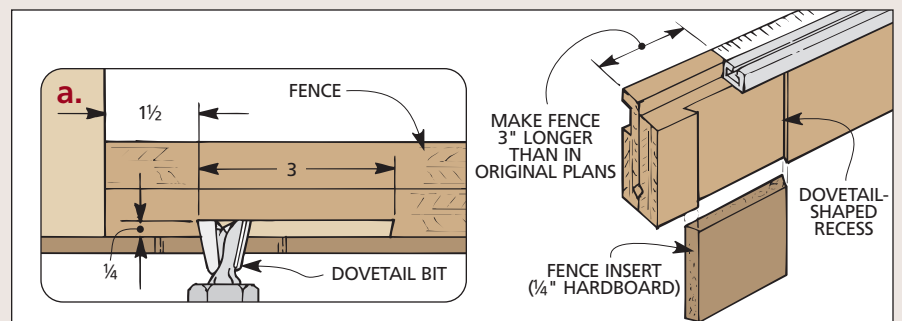
While you're at it, you'll want to make a few extra hardboard inserts. That's because it's hard to stop your cut before the table saw blade passes through the insert. So the extension on your fence will eventually get pretty chewed up. This isn't really a problem though, since all

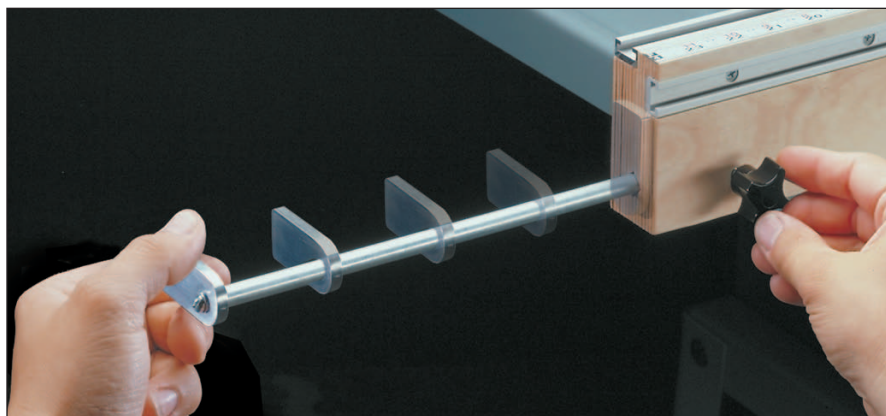
you'll have to do is change the old insert for a new one as needed.

- Finally, cut each insert to length to match the height of the fence.



MATERIALS LIST	
CHANGED PART	
A Front/Back Faces (2)	$\frac{3}{4}$ " ply - 3 $\frac{1}{2}$ x 27
NEW PART	
E Insert (1)	$\frac{1}{4}$ " hdbd. - 3 x 3 $\frac{1}{2}$





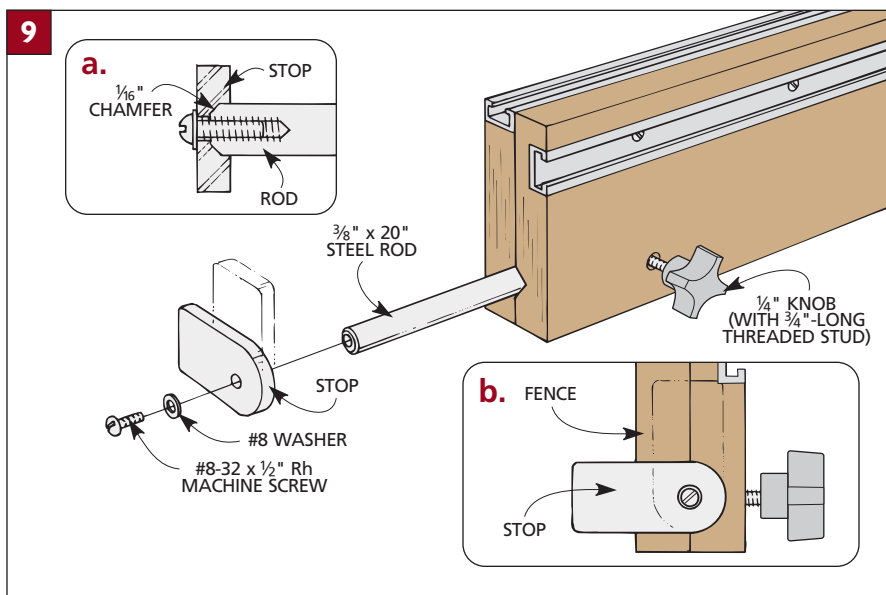
EXTENSION STOP

To make repeat cuts accurately when working with long pieces (up to 41½" long), I added an extension stop. The extension stop slides out from the end of the fence and explains the need for the V-grooves you routed earlier (see photo at left). Once you finish making a cut, just push the metal rod that holds the stop back into the body of the fence and lock it in place for storage.

There's really nothing complicated about the extension stop (*Fig. 9*). It consists of two parts: a long steel rod and a short, flat aluminum stop. As it turns out, most of the groundwork for these parts is already complete.

STOP. Take the stop, for instance. It's the small metal block with a curved end that was made earlier from the aluminum plate. Notice how the stop can be pivoted up and down (*Fig. 9*). That's because it's fixed onto the end of the rod which rotates inside the slot.

When the rod is extended, the idea is to swing the stop down so it sticks out in front of the fence, parallel to the saw's tabletop (*Fig. 9b*). In this position, it provides a rigid support that won't flex when you butt the end of a board against it. When you slide the rod back into the fence, rotate the stop to the "up" position so it's out of the way, stored neatly against the end of the fence.



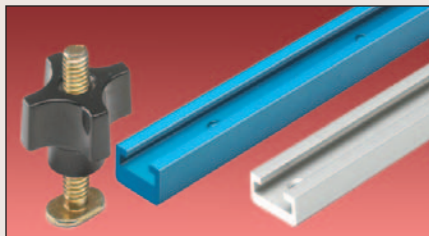
SHOP INFO

T-Track

Shop-made jigs and fixtures are a staple in my workshop. They often make a difficult task easier, more accurate, and a lot safer to complete.

Some get used once and then they're tossed in the scrap bin. But if a jig is going to see frequent use, it's best to carefully select the material you use to build it. That's why T-track gets used in a lot of the jigs and fixtures I build.

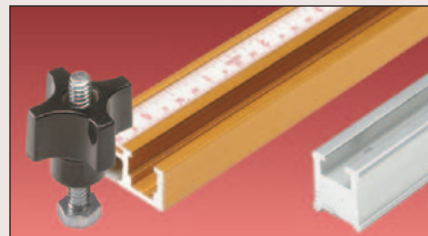
If you're building a jig and you want to make it adjustable, T-track is a quick and easy way to do it. Most T-track is made of extruded aluminum, a process that produces a strong, durable product. It's available in varying lengths and fastens in place with a few screws that pass through the bottom of the T-track. For shorter lengths, you can easily cut it with a carbide-tipped saw blade or a hack saw.



Toilet Bolt Style. This style of T-track accepts a toilet (flange) bolt. A toilet bolt requires a shallow groove or rabbet in the T-track for mounting.

Note: T-track varies in thickness, so be sure to design your jig to accommodate it and not the other way around. (For sources, see page 126.)

DIFFERENT STYLES. Regardless of how it's manufactured, all T-track operates on the same basic principle. The key is a



Hex Bolt Style. With hex bolt T-track, the head of the bolt rides in the track. This style of T-track often has an extra slot for adding a measuring tape (rule).

slot in the track that accepts the head of a toilet bolt (left photo) or the head of a hex bolt (right photo). By slipping an accessory (like a stop block) over the toilet or hex bolt, you can slide the accessory along the track. Then just tighten a knob on the bolt to lock it in place.

POCKET. If you look closely, you'll see there's a counterbored shank hole in the stop (*Fig. 10*). It forms a pocket that fits over the end of the rod. I typically use a Forstner bit to drill a flat-bottomed counterbore. But since the stop is metal, I had to use a twist bit instead. The result is a counterbore that's beveled on the bottom.

That's okay, but there is one thing to keep in mind — the depth of the hole. To "seat" the rod securely in the stop, you'll want to drill the hole deep enough to create a shoulder that's at least $\frac{1}{8}$ " deep (*Fig. 10a*). Then follow up by drilling a shank hole for a machine screw that's used to hold the stop in place.

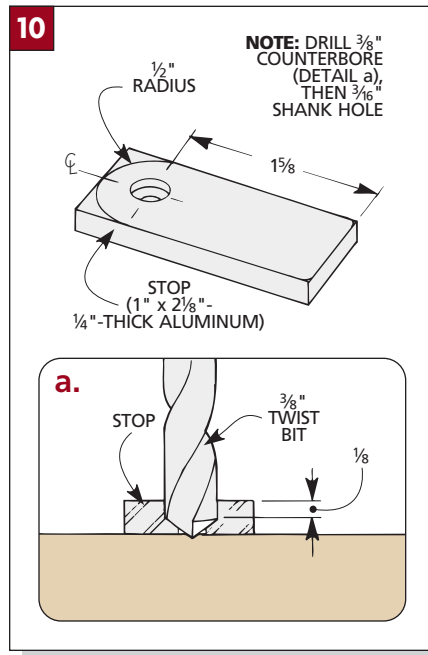
STEEL ROD. At this point, you can turn your attention to the rod that slides in and out of the fence. It's a $\frac{3}{8}$ "-dia. steel rod that's housed inside the slot in the fence. (I picked up a steel rod at a home center and then cut it 20" long with a hack saw.)

While you're at it, it's a good idea to file a small ($\frac{1}{16}$ ") chamfer on one end of the rod. This chamfer will make it easier to fit the rod into the pocket in the stop.

As I mentioned earlier, the stop is attached to the end of the rod with a machine screw. Attaching the stop requires drilling a centered hole in the end of the steel rod and then tapping threads in it to accept the machine screw.

There is an easy way to locate this hole. First, set the stop over the end of the rod and then use it as a template. To do this, tighten the rod in a vise so the end sticks up above it by a small amount.

Just how much the rod should project is a trial and error process. What you're looking for is to have the stop sitting flat on the vise (*Figs. 11 and 11a*). This way, the top of the vise provides a solid platform so you can hold the stop steady as you drill the pilot hole.

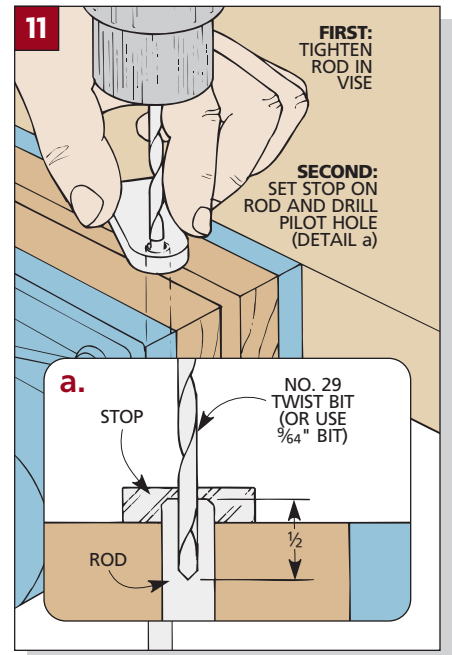


Note: I drilled a pilot hole with a No. 29 twist bit (or you can substitute a $\frac{9}{64}$ " brad point drill bit).

TAP THREADS. Now it's just a matter of tapping threads in the hole to accept the machine screw that fastens the stop to the rod. (I used an 8-32 tap.)

Note: For more information about tapping threads, refer to the Shop Info box on page 33.

ASSEMBLY. Just a couple of notes about assembling the stop. To prevent the screw that secures it to the rod from loosening, apply some thread lock to the threads before installing the stop. Then, after slipping the rod into the slot, thread a studed knob into the T-nut that was installed earlier in the back of the fence. Tightening the knob allows you to lock the stop in place. Loosening the knob allows you to slide it in and out.



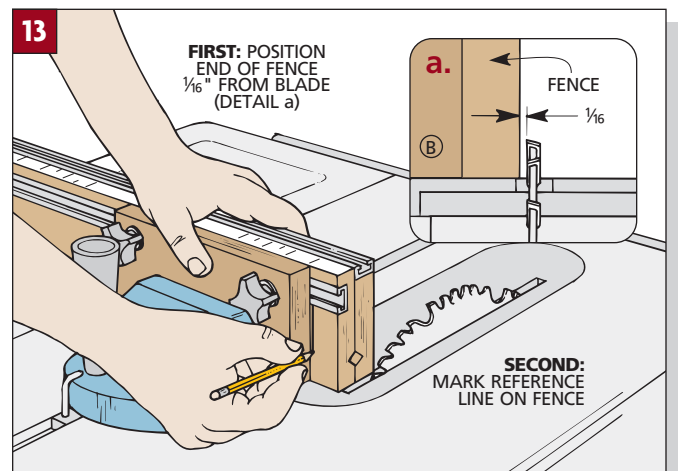
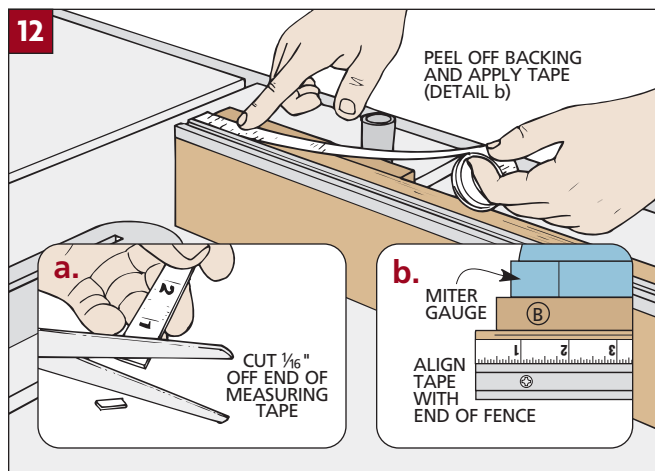
SETUP

Setting up the miter gauge fence is a simple, two-step process.

MEASURING TAPE. The first step is to install a measuring tape. Since I usually place the miter gauge to the left of the saw blade, I used an adhesive-backed measuring tape that reads from right to left.

Before attaching the measuring tape, there's one more thing to mention. To avoid cutting into the fence, I wanted it to be $\frac{1}{16}$ " away from the blade when making a 90° cut. So I trimmed $\frac{1}{16}$ " from the end (*Fig. 12a*) and then applied the tape to the fence (*Figs. 12 and 12b*).

REFERENCE LINE. To make it easy to return to that setting (after repositioning the fence to cut a miter, for instance), I used a pencil to mark a reference line on the fence (*Figs. 13 and 13a*). ■



Auxiliary Rip Fence

This is one fence that covers all the bases. With it you can safely “bury” a dado blade under auxiliary faces, hold a workpiece with a featherboard, and even add a push block or stop block.



Now and then, I need to add an accessory to my table saw's rip fence. Sometimes I need to attach an auxiliary fence to “bury” a dado blade for cutting a rabbet. Or I need to position a featherboard to hold a workpiece against the saw table. To do these types of jobs right, I've found the rip fence often needs a little extra help.

The problem is, it can be a hassle to do this without a clamp or two getting in the way of the cut. To make this job easier, I built an all-purpose Auxiliary Rip Fence.

The auxiliary fence couldn't be much simpler to build. It consists of just three strips of plywood with a pair of rabbets

and grooves. The U-shaped auxiliary fence fits down over your existing rip fence. It's secured in place using a couple of carriage bolts and star knobs.

T-TRACKS. But what makes this fence work so well is the T-tracks that rest in the grooves. Adding an accessory only takes a couple of seconds. Just slide the accessory (and toilet bolt) into position and lock it in place with a washer and knob.

Note: The auxiliary fence I built is for a rip fence that locks at the front and rear (see photo). But what if you have a T-square style rip fence? Don't worry. The Designer's Notebook on page 99 has more on building an auxiliary fence to fit.

ACCESSORIES. There are several simple accessories that can be made to use with the Auxiliary Rip Fence. To start, I made a couple of auxiliary faces. A tall fence face and a dado fence face attach to the auxiliary fence with toilet bolts.

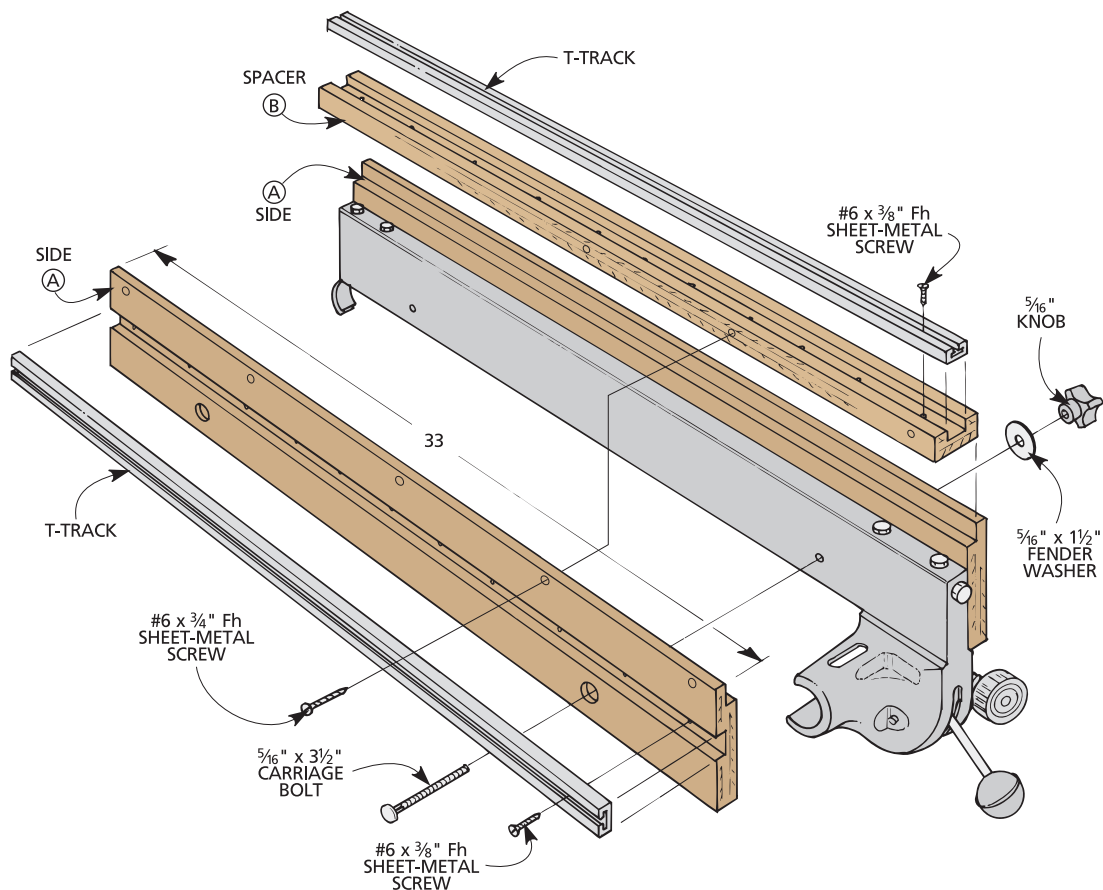
I also made a push block with a sacrificial hardboard heel that hooks onto a workpiece so you can safely push even the narrowest strips past the blade.

Finally, I made a simple block for cutting small workpieces to identical lengths and an adjustable featherboard that holds a workpiece firmly against the saw table. You'll find more on how to build these accessories starting on page 99.

EXPLODED VIEW

OVERALL DIMENSIONS:

33W x 2½D x 3¾H (WITHOUT ACCESSORIES)



MATERIALS LIST

WOOD

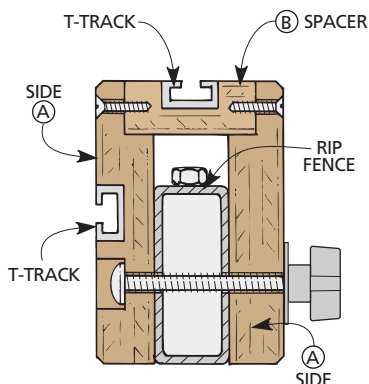
- A** Sides (2) ¾ ply - 3¾ x 33
B Spacer (1) ¾ ply - 1¾ x 33

HARDWARE SUPPLIES

- (22) No. 6 x ¾ inch Fh sheet-metal screws
 (10) No. 6 x ¾ inch Fh sheet-metal screws
 (2) T-tracks (33" long)
 (2) ⅝ inch x 3½ inch carriage bolts
 (2) ⅝ inch knobs
 (2) ⅝ inch x 1½ inch fender washers

1

END VIEW



NOTE: TO BUILD AN AUXILIARY FENCE FOR A T-SQUARE STYLE RIP FENCE, SEE THE DESIGNER'S NOTEBOOK ON PAGE 99

FENCE CONSTRUCTION

I started on the U-shaped fence by making the sides (A) from ¾ inch plywood. (I used Baltic birch.)

Note: The auxiliary fence is designed to fit rip fences that lock at the front and rear. Depending on your rip fence, you may need to adjust some of the dimensions. Or if you own a T-square style rip fence, you'll be able to build a similar auxiliary fence for it as well. (See the Designer's Notebook on page 99.)

The sides are cut to match the length of the rip fence. And they're wide (tall) enough to provide good support for a workpiece and to clear any obstructions on the top (*Fig. 1*).

RABBETS AND GROOVE. Once the sides are cut to final size, you can cut a rabbet at the top of each workpiece (*Fig. 2a*). I also cut a groove in the face opposite the rabbet in one of the side pieces (*Fig. 2*). Why only one side? The answer is simple. If you ever need to use the auxiliary rip fence on the opposite side of the table saw blade, it's quick and easy to remove the fence and flip it around.

The only thing critical about cutting the groove is to size it so the T-track will fit flush with the face of the fence. This way there's no chance the T-track will interfere with any of the accessories.

Note: To do this, it's best to position the groove at least $1\frac{3}{4}$ " up from the bottom edge (*Fig. 2a*).

DRILL MOUNTING HOLES. The next step is to locate the mounting holes used to attach the auxiliary fence. It's secured with knobs, washers, and a couple of carriage bolts, but you'll learn more about this later. Here again, there are a couple of things to keep in mind.

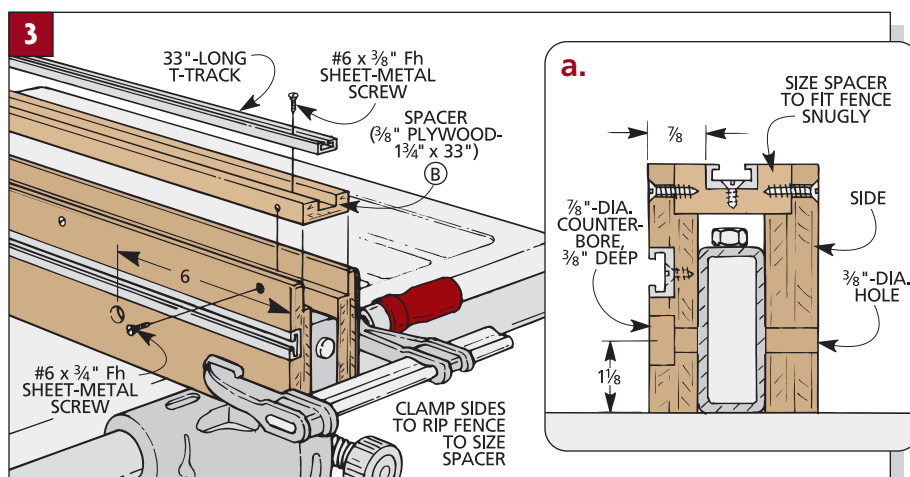
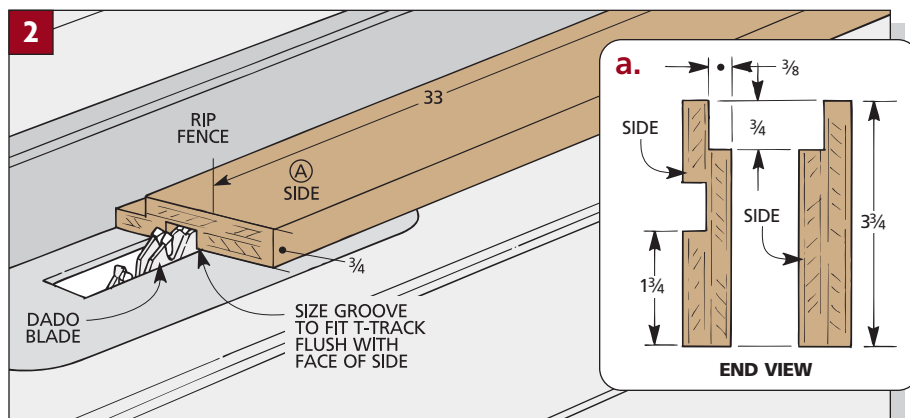
First, the holes are drilled the same distance in from each end (*Fig. 3*). This way the fence can be used with either face toward the blade. And second, to avoid interfering with the cut, the head of the carriage bolt rests in a counterbore drilled in the face of the fence (refer to *Fig. 1* on page 97 and *Fig. 3a*).

SPACER. Now you're ready to join the two sides with a $\frac{3}{4}$ " plywood spacer (B). The trick is determining the width of the spacer. What you're looking for here is a snug fit. I found it easiest to sandwich the rip fence between the side pieces and clamp them firmly in place (*Fig. 3*). Then all you have to do is measure the distance between the rabbets and cut the spacer to match. (Mine was $1\frac{3}{4}$ " wide.)

SECOND GROOVE. The spacer has a long groove cut along its length to accept a second T-track (*Figs. 3 and 3a*). Here again, it's sized so the T-track will fit flush. And regardless of the width of the spacer, the groove is positioned $\frac{7}{8}$ " in from the outside face of the fence.

ASSEMBLY. Now you're ready to assemble the auxiliary fence by gluing and screwing the sides to the spacer. Then all that's left is to screw each T-track into its groove.

One problem with the exposed edges of plywood is the tendency to catch an edge and split off the veneer (or get a splinter). To avoid this, I eased each outside edge on the sides with a carbide-tipped, 45° chamfer bit (*Fig. 4a*).

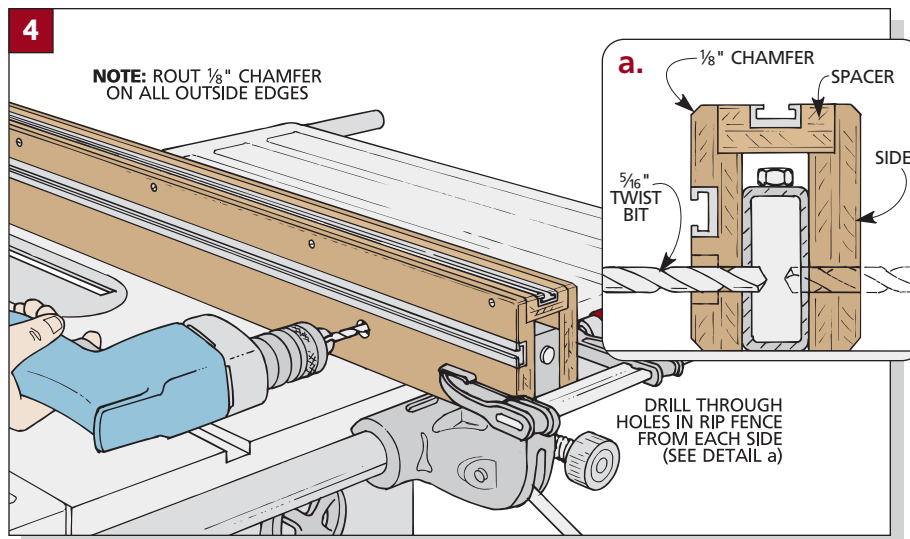


Note: The $\frac{1}{8}$ " chamfer on the bottom corners also helps by providing a small space for dust relief.

INSTALLATION. As I mentioned before, the Auxiliary Rip Fence is attached with a pair of carriage bolts. Now, you might be asking, why use bolts if the fit is snug? The answer is, to avoid lifting the auxiliary fence when you slide a workpiece underneath the featherboard.

Note: A T-square style rip fence that only locks at the front needs an extra part to lock the fence down. Refer to the Designer's Notebook on the next page.

Finally, to attach the auxiliary fence, use a twist bit to drill through the mounting holes on each side of the auxiliary fence (*Figs. 4 and 4a*). Then just slip the carriage bolt, washer, and knob in place to lock the fence securely.



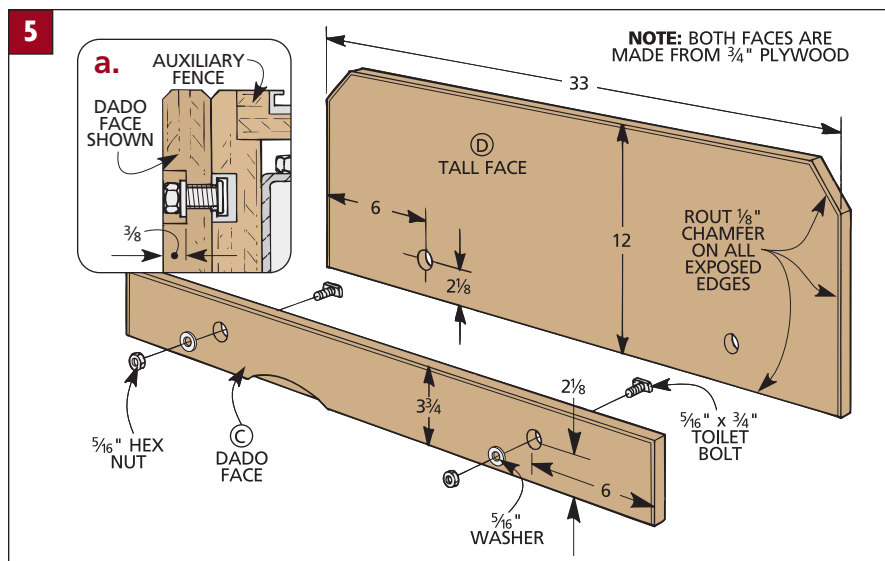
AUXILIARY FACES

With the auxiliary fence complete, you can start working on the auxiliary faces.

These accessories are nothing more than pieces of $\frac{3}{4}$ " plywood that mount to the T-track in the side of the auxiliary

fence using cutoff toilet bolts, nuts, and washers (Figs. 5 and 5a).

The dado face (C) allows you to "bury" a dado blade for cutting tenons and rabbets. And the tall face (D) provides additional support for wider (taller) workpieces (see photos below).



MATERIALS LIST	
AUXILIARY FACES	
C Dado Face (1)	$\frac{3}{4}$ ply - $3\frac{3}{4}$ x 33
D Tall Face (1)	$\frac{3}{4}$ ply - 12 x 33
HARDWARE SUPPLIES	
(2) $\frac{5}{16}$ " x $\frac{3}{4}$ " toilet bolts	
(2) $\frac{5}{16}$ " washers and hex nuts	



DESIGNER'S NOTEBOOK

Lock this auxiliary fence in place with a Hold-Down.

CONSTRUCTION NOTES:

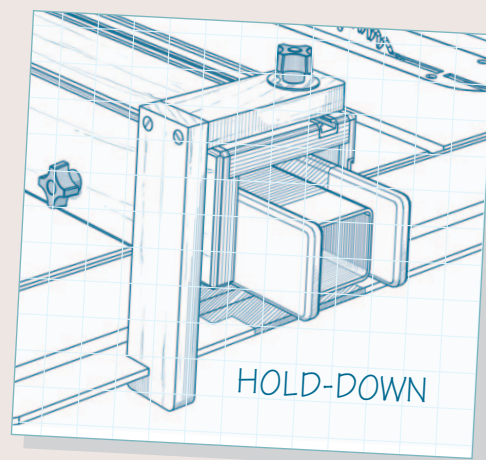
■ To build an auxiliary fence for a T-square style rip fence, you need a way to lock it in place at the back. To do this, you have to build an L-shaped Hold-Down

that hooks over the rear guide rail. But first, you'll need to address the fact that the auxiliary fence is also wider than before.

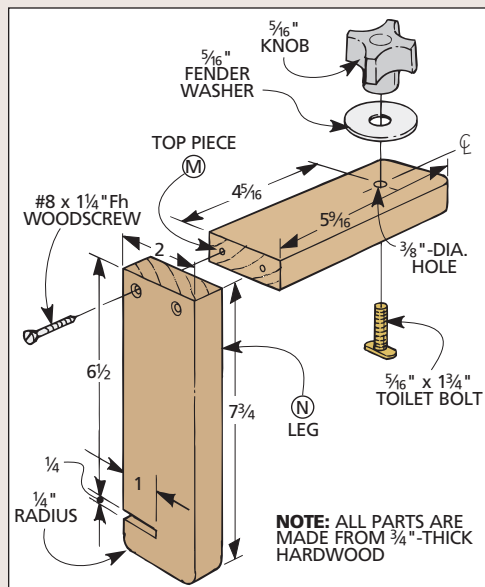
■ The nice thing about this is there isn't much different in building the auxiliary fence. All the parts are the same size as before, except for the spacer (B), which is wider so it fits over a wide rip fence. And don't forget when you cut the groove for the T-track, it's still the same distance in ($\frac{7}{8}$ ") from the face of the auxiliary fence.

■ After assembling the auxiliary fence and mounting it with longer carriage bolts, you can add the Hold-Down. It's just an L-shaped assembly consisting of a top piece (M) and leg (N) that are glued and screwed together (see drawing).

■ To complete the T-square style rip fence, you'll need to cut a small notch in the leg that lets you slip the



Hold-Down over the back of the rip fence assembly. This notch acts like a hook to hold the fence firmly against the table.



MATERIALS LIST	
NEW PARTS	
M Top Piece (1)	$\frac{3}{4}$ x 2 - $5\frac{9}{16}$
N Leg (1)	$\frac{3}{4}$ x 2 - $7\frac{3}{4}$
HARDWARE SUPPLIES	
(2) No. 8 x $1\frac{1}{4}$ " Fh woodscrews	
(1) $\frac{5}{16}$ " x $1\frac{3}{4}$ " toilet bolt	
(1) $\frac{5}{16}$ " knob	
(1) $\frac{5}{16}$ " fender washer	



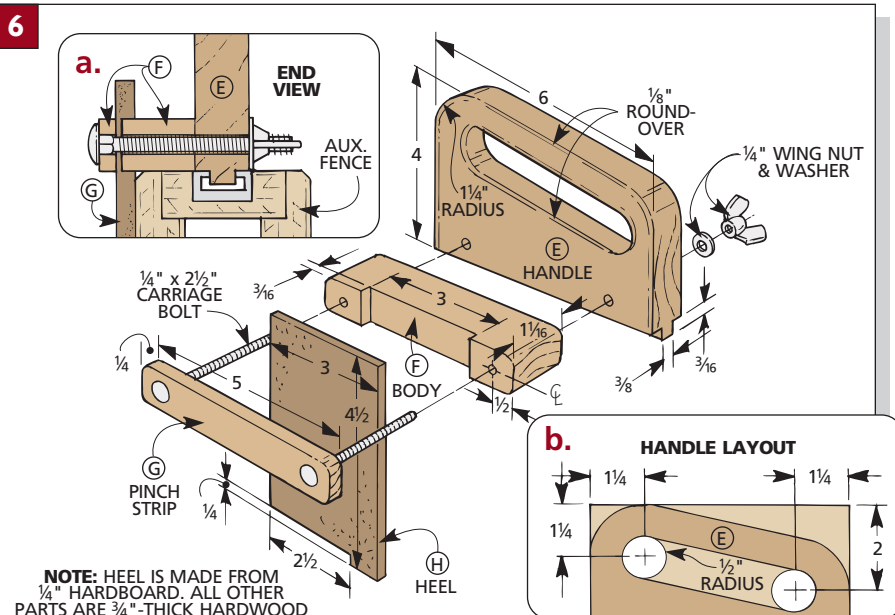
MATERIALS LIST

PUSH BLOCK

E Handle (1)	$\frac{3}{4}$ x 4 - 6
F Body (1)	$\frac{3}{4}$ x $1\frac{1}{16}$ - 5
G Pinch Strip (1)	$\frac{3}{4}$ x $\frac{1}{4}$ - 5
H Heel (1)	$\frac{1}{4}$ x 3 - $4\frac{1}{2}$

HARDWARE SUPPLIES

- (2) $\frac{1}{4}$ x $2\frac{1}{2}$ " carriage bolts
- (2) $\frac{1}{4}$ " wing nuts and washers



PUSH BLOCK

A good push block keeps your hands safely away from the table saw blade and helps to push narrow strips through once the cut is complete (see photo above).

What makes this push block a little different is the handle that rides in the T-track on the top of the fence. To push a thin strip through, there's a hardboard

heel that can be adjusted up (or down) to match the thickness of the workpiece.

HANDLE. The handle (E) is made from a piece of $\frac{3}{4}$ "-thick hard maple. After cutting a short tongue along the bottom to fit the T-track (Fig. 6), I cut the handle to final shape and used a $\frac{1}{8}$ " roundover bit to soften the edges (Figs. 6 and 6b).

BODY. Attached to the handle is a two-part body. A shallow notch ($\frac{3}{16}$ ") in the

main body (F) provides room for a heel. And a narrow outside pinch strip (G) holds the heel in place with carriage bolts, washers, and wing nuts (Fig. 6a).

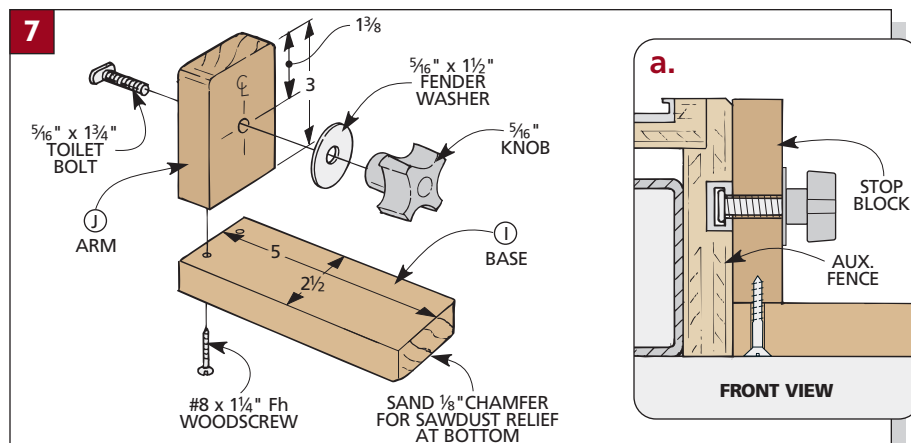
HEEL. All that's left to complete the push block is add the heel (H). It's a replaceable piece of $\frac{1}{4}$ " hardboard with a small tab on the bottom edge. This tab catches the edge of the workpiece to push it past the saw blade.



STOP BLOCK

Another accessory you can use with the auxiliary fence that doesn't take much time to make (but comes in handy) is an ordinary stop block. It's an easy way to cut a number of small workpieces to identical length. Besides locking easily in place, the L-shaped stop block provides plenty of space between the blade and fence to avoid trapping the workpiece (see the photo above).

ARM AND BASE. The stop block consists of only two parts: a fixed base (I) and



an adjustable attachment arm (J). They're each made from $\frac{3}{4}$ "-thick hardwood. (Again, I used hard maple.) Once they're cut to size, simply glue and screw them together (Figs. 7 and 7a).

Now all that's left is to drill a centered hole in the arm that allows you to attach the stop block to the T-track. And finally, I sanded a small chamfer along the bottom edge of the base to provide clearance for dust and chips (Fig. 7).

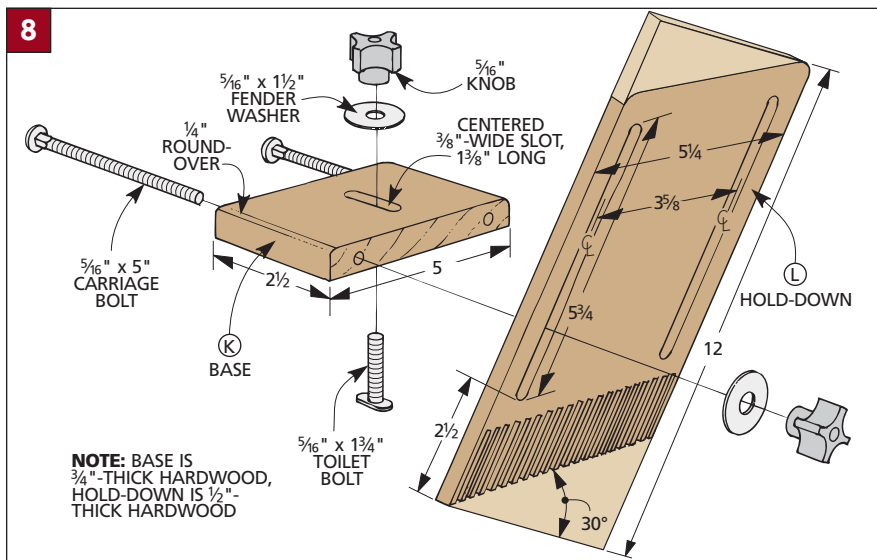
MATERIALS LIST

STOP BLOCK

I Base (1)	$\frac{3}{4}$ x $2\frac{1}{2}$ - 5
J Arm (1)	$\frac{3}{4}$ x $2\frac{1}{2}$ - 3

HARDWARE SUPPLIES

- (2) No. 8 x $1\frac{1}{4}$ " Fh wood screws
- (1) $\frac{5}{16}$ x $1\frac{3}{4}$ " toilet bolt
- (1) $\frac{5}{16}$ x $1\frac{1}{2}$ " fender washer
- (1) $\frac{5}{16}$ " star knob



FEATHERBOARD

One last accessory that's a natural for the auxiliary fence is a featherboard. Besides holding a workpiece firmly against the saw table for an accurate cut, it can also prevent a workpiece from kicking back at you.

It consists of two parts: a base for attaching the featherboard to the auxiliary fence, and a hold-down with flexible fingers that press against the workpiece.

BASE. The base (K) is nothing more than a $\frac{3}{4}$ "-thick piece of hard maple that rests on top of the auxiliary fence. To allow you to use the hold-down with the dado face installed, there's a short slot cut in the top of the base. And two holes

drilled through each end provide a way to attach the hold-down with carriage bolts, washers, and knobs (*Fig. 8*).

HOLD-DOWN. Since the hold-down (L) is going to take a lot of abuse, I made it from $\frac{1}{2}$ "-thick hard maple.

The hold-down starts out as a blank cut to rough width and length. After laying out the location of the slots, you can cut and sand them smooth (*Fig. 8*).

So the fingers "grip" the workpiece, cut one end of the blank at a 30° angle. Then cut the opposite end to match.

CUT FINGERS. The next step is to cut a series of kerfs to create the fingers. To space the kerfs evenly, I made an indexing jig for my miter gauge. (See the Shop Jig box below.)

MATERIALS LIST

FEATHERBOARD

K Base (1)	$\frac{3}{4}$ x $2\frac{1}{2}$ - 5
L Hold-down (1)	$\frac{1}{2}$ x $5\frac{1}{4}$ - 12

HARDWARE SUPPLIES

- (2) $\frac{5}{16}$ " x 5" carriage bolts
- (3) $\frac{5}{16}$ " x $1\frac{1}{2}$ " fender washers
- (3) $\frac{5}{16}$ " star knobs
- (1) $\frac{5}{16}$ " x $1\frac{3}{4}$ " toilet bolt

Once all the kerfs for the fingers have been cut, you can trim the hold-down if needed. You want there to be a full finger along each edge. Then all that's left to do is attach the hold-down to the base with a pair of carriage bolts and knobs. ■

SHOP JIG

Indexing Jig

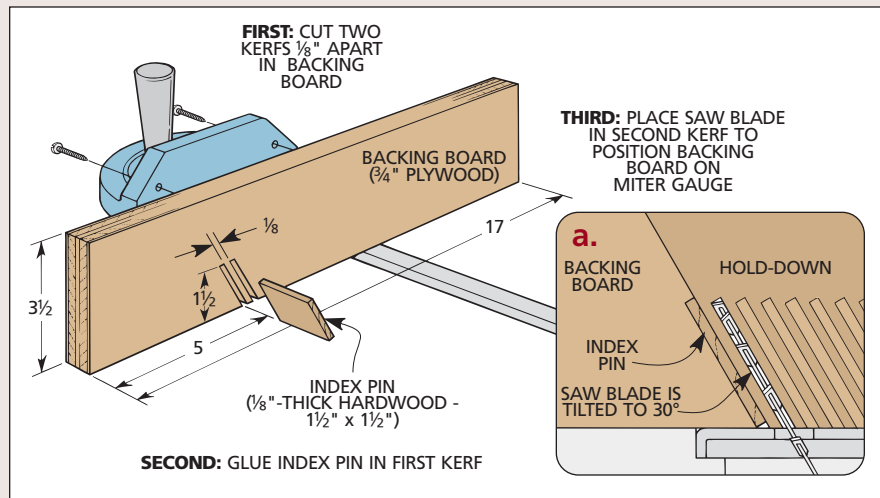
Cutting kerfs in the hold-down can be difficult, but this indexing jig makes the job quick and easy (see drawing).

The jig has two saw kerfs that are spaced $\frac{1}{8}$ " apart. One kerf has a hardwood index pin glued in it. And the other kerf lines up with the saw blade.

Note: Tilt the blade to a 30° angle.

To cut the first kerf, clamp the workpiece to the plywood backing board so it's tight against the pin (detail 'a'). Then make the first pass.

After the first kerf is cut, unclamp the workpiece and shift it over onto the index pin. Then reclamp the workpiece and take another pass. Repeat this process to complete all the fingers on the hold-down.



Miter Jig

Here's a way to easily take the “pain” out of cutting a perfect 45° miter — a Miter Jig for the table saw. It's just a plywood base, a hardwood runner, and a series of fences to hold the workpiece in position.



One of the first projects I tackled as a woodworker was a picture frame. It was almost my last project. The challenge when you're dealing with more than one miter (like on a picture frame, or any workpiece that wraps around a corner with miters) is cutting the molding pieces so there are no gaps at the corners. It didn't take long to realize that if just one of the 45° miters is off, it will throw the other three out of whack as well. Although it takes some effort to cut perfect miters, it can be done.

In order to do this, there are two basic criteria that need to be met. First, the ends of all the pieces must be mitered at

exactly 45°. And opposite sides of the frame (the top and bottom, and the two sides) must be *exactly* the same length.

The easiest way to accomplish both tasks is to build a Miter Jig. The jig I use has two fences for cutting the miters at 45°, and an adjustable stop block for cutting the pieces to exact lengths.

FENCES. The two fences are actually three separate pieces: a “first-cut” fence, a “second-cut” fence, and a “stop-block” fence. The purposes of these fences are pretty much as their names imply. You make the initial miter cut on all the workpieces holding the pieces against the short first-cut fence (see main photo).

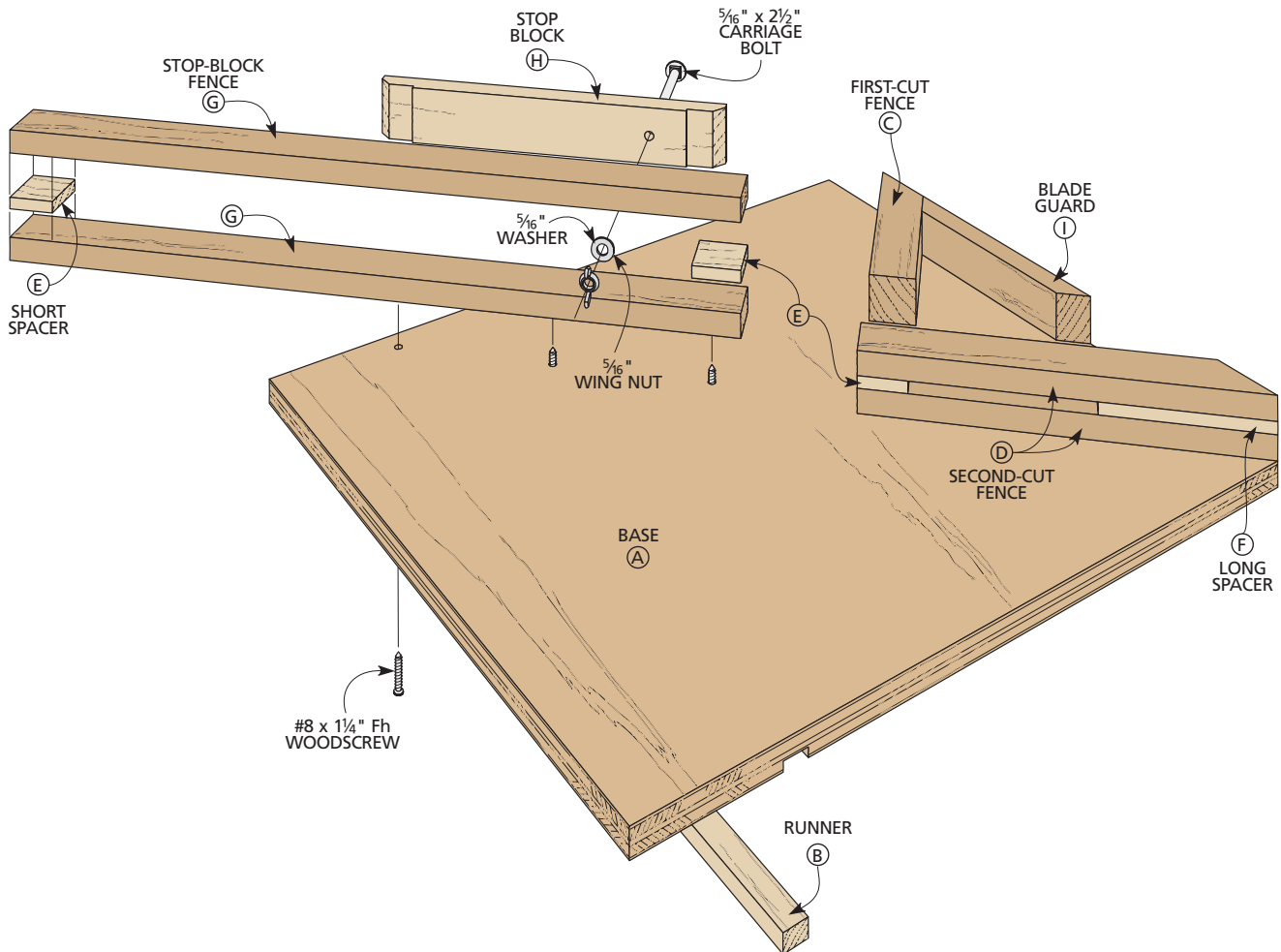
Then, a stop block is positioned and locked in place on the stop-block fence (inset photo). This way, you can hold the workpiece against the second-cut fence and cut all the pieces to exactly the same length. (For more on using the Miter Gauge to make perfect miters, refer to the Technique article on page 105.)

BLADE GUARD. Since a lot of the cuts you'll be making with this Miter Jig will be made with your hand near the spinning table saw blade, I added one more piece that provides a little bit of safety. It's a blade guard, made from a short piece of hardwood, that's attached along the edge of the jig that passes the blade.

EXPLODED VIEW

OVERALL DIMENSIONS:

24W x 21D x 2⁵/₈H



CUTTING DIAGRAM

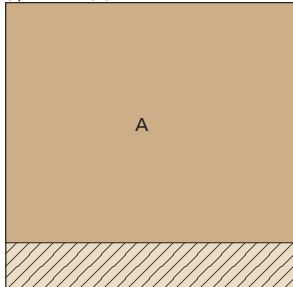
3/4 x 3 1/2 - 48 (1.2 Bd. Ft.)



3/4 x 3 1/2 - 36 (.9 Bd. Ft.)



3/4" PLYWOOD - 24 x 24



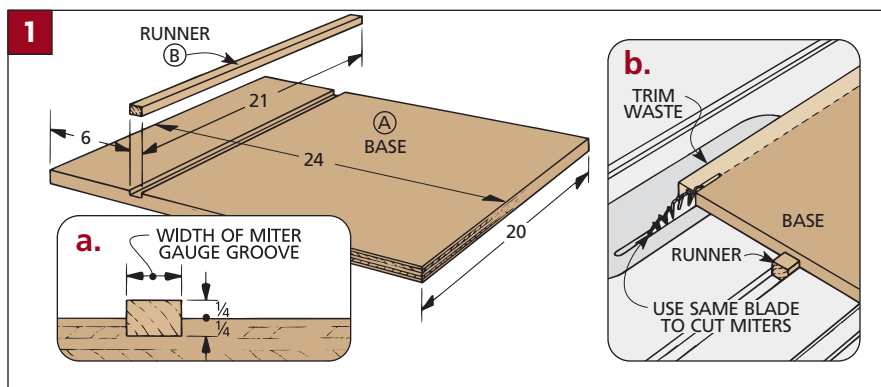
MATERIALS LIST

WOOD

A Base (1)	3/4 ply - 24 x 20
B Runner (1)	1/2 x 3/4 rgh. - 21
C First-Cut Fence (1)	1 1/2 x 1 1/2 - 8
D Second-Cut Fence (2)	3/4 x 1 1/2 - 13
E Short Spacers (3)	3/8 x 1 1/2 - 1 1/2
F Long Spacer (1)	3/8 x 1 1/2 - 6
G Stop-Block Fence (2)	3/4 x 1 1/2 - 24
H Stop Block (1)	3/4 x 1 7/8 - 12
I Blade Guard (1)	3/4 x 1 1/2 - 7 3/4

HARDWARE SUPPLIES

- (10) No. 8 x 1 1/4" Fh woodscrews
- (1) 5/16" x 2 1/2" carriage bolt
- (1) 5/16" washer
- (1) 5/16" wing nut



BASE

To make the jig, begin by cutting the base (A) to size from $\frac{3}{4}$ " plywood. (I used oak plywood.) It's just a platform for the fences that are added later.

The jig is guided on the table saw with a $\frac{1}{2}$ "-thick hardwood runner. To mount it, cut a dado about 6" from one edge (Figs. 1 and 1a). (Depending on your saw, position it so the right edge of the plywood extends just beyond the blade.)

GUIDE RUNNER. After you've cut the dado, cut a guide runner (B) to fit in it. I made my runner about 1" longer than the plywood base so it's easy to see and position in the slot on the table saw.

TRIM EDGE. Now the right edge of the base can be trimmed off (Fig. 1b). Cut this edge with the same saw blade you'll use to cut the miters, so the edge of the plywood is exactly in line with the blade.

FENCES

The jig has three fences: a first-cut fence, a second-cut fence, and a stop-block fence. (First-cut and second-cut refer to the cutting sequence for cutting the miters on the frame pieces.)

FIRST-CUT FENCE. To make the first-cut fence (C), I used 2x4 stock. Trim the stock down to $\frac{1}{2}$ " square, and cut it to a length of 8" (Fig. 2).

SECOND-CUT FENCE. The second-cut fence (D) is made from two strips of $\frac{3}{4}$ "-thick stock with two spacer blocks between them. These spacers form a $\frac{3}{8}$ " slot used to mount the stop block (Fig. 2).

To make the spacers, resaw a piece of $\frac{3}{4}$ "-thick stock down to $\frac{3}{8}$ " thick. Then cut off a short spacer (E) and a long spacer (F), and glue them between the two fence strips.

STOP-BLOCK FENCE. The stop-block fence (G) is made

just like the second-cut fence, but it's longer and it uses two short spacers, instead of a short and a long one (Fig. 2).

SQUARE UP FENCES. When the glue was dry on the second-cut fence and stop-block fence, I squared up the front and back edges on the jointer.

ASSEMBLE JIG

Now the fences can be mounted to the base. The critical part of making this jig is to align the first-cut fence exactly 90° to the second-cut fence, and also to make sure both fences are 45° to the right edge of the base (the path of the blade).

ALIGN AND MOUNT FENCES. I used a framing square to roughly align the two fences. Lay the square on the base so the 12" mark on the inner edge of the square is on the bottom right-hand corner (Fig. 3). Then place the other 12" inside mark on the right edge of the base. Now clamp the square to the base.

To attach the first-cut fence, slide it against the square so one end is at the 5" mark (Fig. 3). I drilled oversized shank holes through the bottom of the base so I could adjust the fences, then I temporarily screwed it in place (Fig. 3a).

Next, I positioned the second-cut fence against the other inner edge of the square, again drilling oversized shank holes and temporarily screwing it in place. (Make sure the end with the short spacer is in the inside corner.)

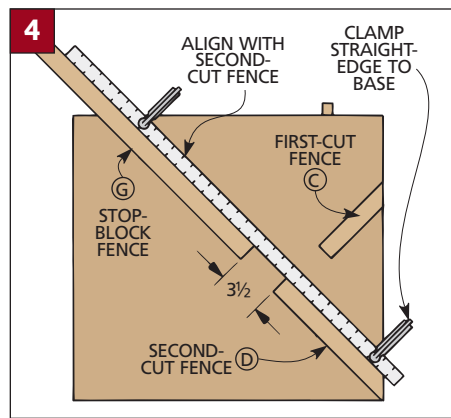
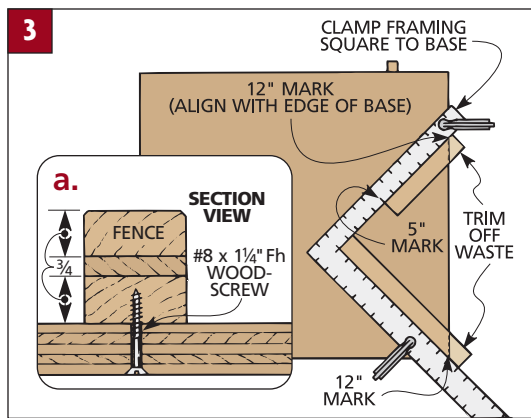
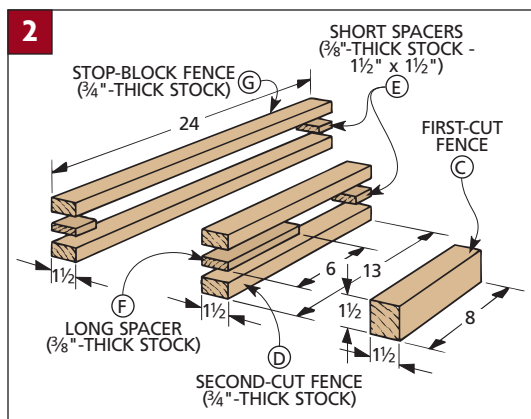
Fine-tune the fences by making test cuts (checking the miters with a triangle). Then glue and screw them all in place.

Finally, I used a straightedge to align the stop-block fence with the second-cut fence (Fig. 4). And I allowed a $\frac{3}{2}$ " space between the two fences to create a gap for the molding pieces.

TRIM ENDS. Now place the jig on the saw and cut off the ends that are hanging over the right edge (Fig. 3).

STOP BLOCK. At this point the fences are aligned to cut perfect 45° angles. All that's needed is a stop block. I made the stop block (H) from a piece of $\frac{3}{4}$ "-thick stock cut to width to match the height of the fences ($1\frac{7}{8}$ ") (Fig. 5).

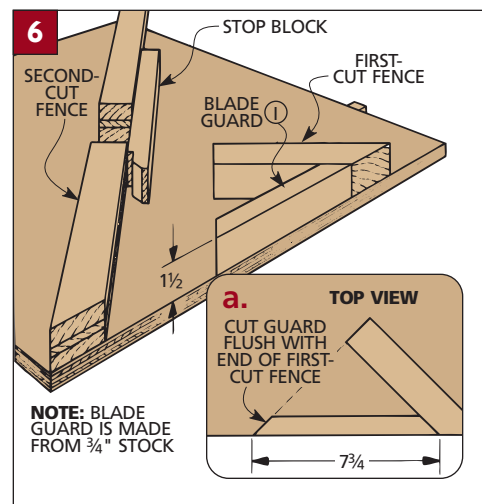
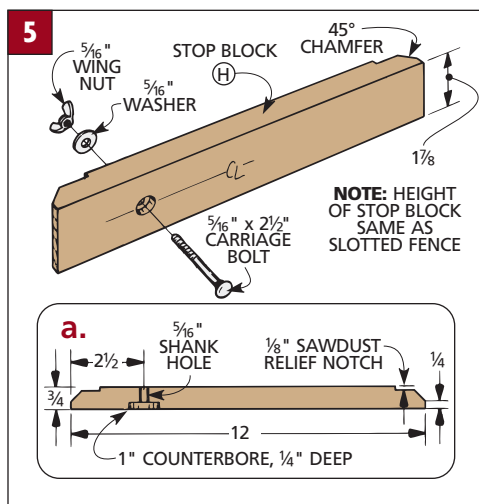
CUT CHAMFERS. After cutting the stop block to size, cut 45° chamfers on the ends (Fig. 5a). The chamfers hold the end of the workpiece with the first miter as the second



miter is cut. I also cut a small notch on the heel of each chamfer for sawdust relief.

To hold the stop block against the fence, I drilled a counterbored hole for a $\frac{5}{16}$ " carriage bolt. (Be sure the hole is aligned with the slot on the stop-block fence.)

BLADE GUARD. The last step is to attach a blade guard (I) along the right edge of the Miter Jig (Fig. 6). To do this, I cut a piece of $\frac{3}{4}$ "-thick stock with 45° miters on both ends and glued it to the base, flush with the right edge.



TECHNIQUE

Mitering Picture Frames

When building projects that require miters (like picture frames), the basic procedure is to cut a 45° miter on one end of each piece first. Then the other end is mitered to final length.

CHOOSE BLADE. The Miter Gauge makes this process easy, but there are a couple of things to think about before starting. The first thing to consider is the saw blade. When crosscutting miters, I use a carbide-tipped *crosscut* blade. Combination blades are nice. But a crosscut blade, with 60 to 80 teeth, makes nice smooth cuts that are easier to glue.

SET BLADE. Even with a perfect blade, you can still have problems. When the blade is mounted in your saw, check it with a try square to make sure it's exactly 90° to the top of the table.

FIRST CUT. The first cut is made by holding the *inside* edge of the molding against the first-cut fence (Fig. 1). Hold it with a firm grip so the piece doesn't slide during the cut. The cut is made so the long point of the miter leads through the saw blade (Fig. 1).

FEED RATE. A slow, steady feed rate is best. If you go too fast, there's a greater chance that the molding will slip. Hold it steady and let the saw do the cutting.

Note: Clear the scrap pieces away after making each cut using a long stick.

SECOND MITER. After the first miter is cut on all the pieces, the second miter can be marked on one piece. This determines the final length of each piece.

However, for picture frames it's not the overall length of each piece that counts, it's the length of the rabbet on the inside edge of each piece. The second miter must be cut so the art (or mat) fits between the inside edges of the rabbets.

To mark this length, lay a ruler in the rabbet of one frame piece (Fig. 2). The second miter is marked off on the inside edge of the rabbet so the measurement equals the size of the picture you're framing plus $\frac{1}{16}$ " extra.

The most common problem here is to make marks on all four pieces and then to try cutting exactly on the marks. This is almost impossible to do.

The jig eliminates this problem by using a stop block so pieces can be cut to exactly the same length.

CUT SECOND MITER. To set up for the second miter cut, hold the molding strip so the *outside* edge is against the second-cut fence with the long point facing away from the blade (Fig. 3).

Move the molding up to the saw blade so the pencil mark aligns with one tooth of the saw blade. (For safety, this is *always* done with the saw unplugged.) Now rotate the saw blade so one tooth is resting right on the pencil mark. Then, tighten the stop block so it's tight against the mitered end (Fig. 3).

Now you're ready to make the second cut on all four pieces of the frame. (If you're building a rectangular frame with moldings that are two different lengths, you'll have to readjust the stop block.)

Safety Note: When the second cut is made, the small waste scrap is sometimes caught by the blade and thrown out. So feed slowly and always stand to the left of the saw blade.

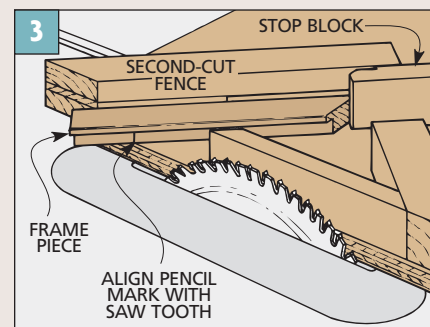
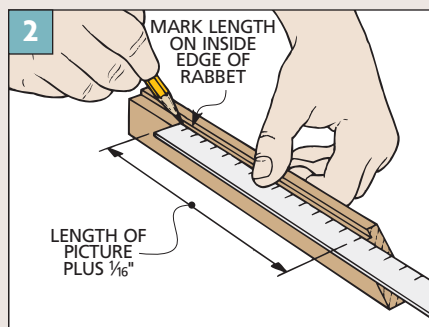
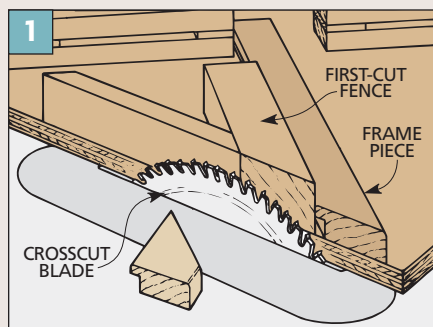


Table Saw Workstation

Take one of the most versatile tools in your shop and make it even better — with upgrades like an integrated router table and outfeed support. That's the idea behind this roll-around saw station.



Over the years, I've met a lot of woodworkers who came up with interesting ways to improve their table saw. I took a few of those ideas, combined the best of them, and came up with this Table Saw Workstation.

With a new and improved rip fence, added storage capabilities, an extended table (and outfeed support) for cutting sheet goods, and a space-saving, integrated router table, this is one of the best upgrades for a contractor's-style table saw that I've seen in a long time.

RIP FENCE. Coming up with all these upgrades started out simply enough. I installed a new, manufactured T-square

rip fence that was more accurate than my old fence and made it easy to rip large sheets of material. (For more information on rip fence upgrades, see page 126.)

TABLE EXTENSION. Once the rip fence had the capacity to rip wide pieces, I needed a large extension table to support them. So I designed an extension table that attaches to the side of the saw.

ROUTER TABLE AND FENCE. The table extension provided an ideal way to save some space in the shop. That's because it doubles as a router table. I even added an adjustable fence so I can use the router table and the table saw without having to "break down" either setup.

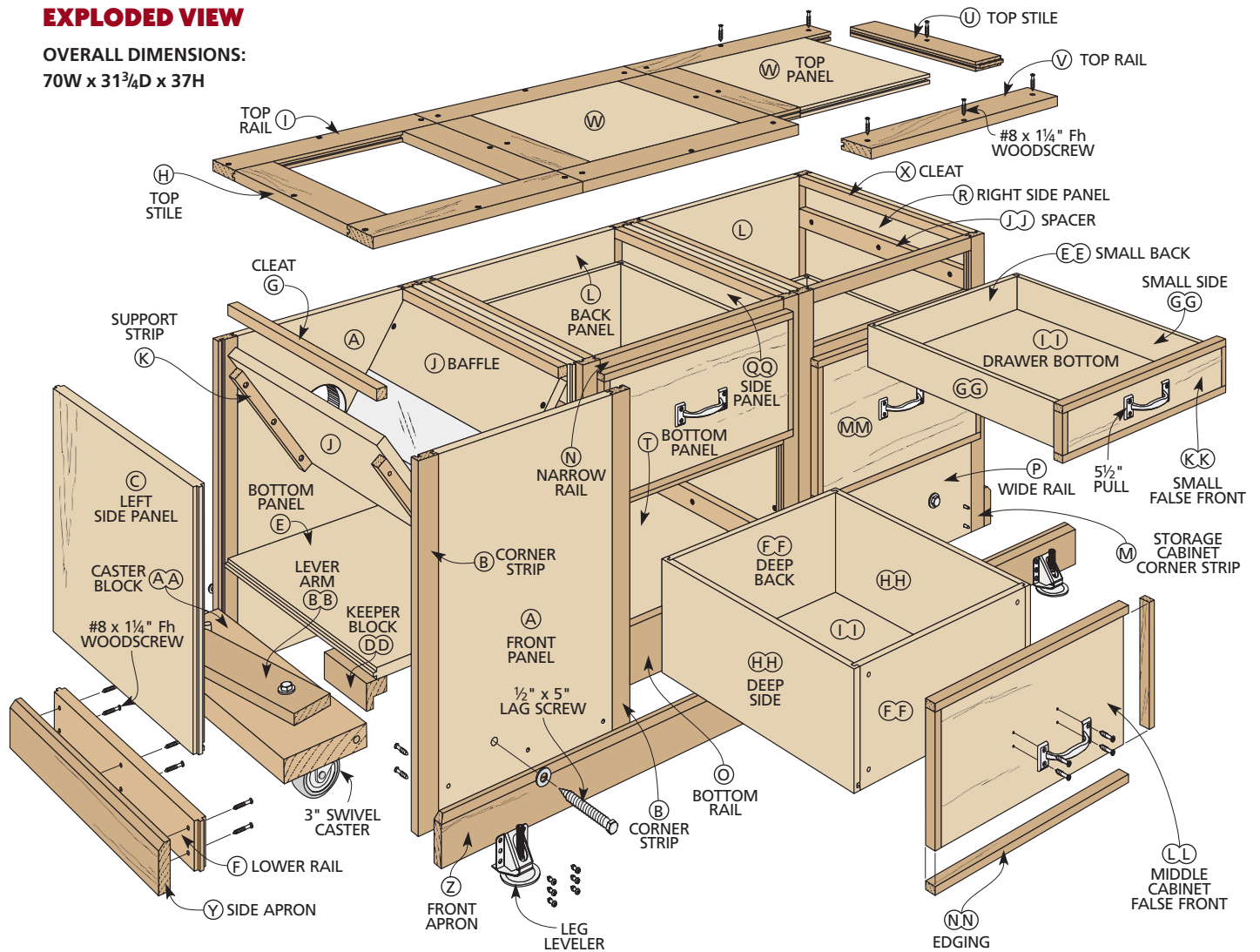
CABINETS. To support the table saw and router table, I designed three cabinets that are "ganged" together as a single unit. The cabinets provide storage and a built-in dust collection system. (If you don't have a dust collector, there are plans for an optional dust bin on page 109.)

And to make the workstation mobile, I added a unique caster system. A hidden lever arm folds out from beneath the cabinet so you can easily raise and lower the caster assembly when needed.

OUTFEED EXTENSION. And to "catch" a long workpiece as it comes off the saw table, I added an outfeed support that folds for storage.

EXPLODED VIEW

OVERALL DIMENSIONS:
70W x 31³/₄D x 37H



MATERIALS LIST

TABLE SAW CABINET

A Front/Back Panels (2)	3/4 ply - 11 1/4 x 23
B Corner Strips (4)	3/4 x 1 1/2 - 23
C Left Side Panel (1)	3/4 ply - 19 1/4 x 16
D Right Side Panel (1)	3/4 ply - 19 1/4 x 23
E Bottom Panel (1)	3/4 ply - 15 3/4 x 18 3/4
F Lower Rail (1)	3/4 x 3 - 19 1/4
G Cleats (2)	3/4 x 3/4 - 18 3/4
H Top Stiles (2)	3/4 x 3 - 14 3/4
I Top Rails (2)	3/4 x 3 - 16 3/4

DUST COLLECTION

J Baffles (2)	3/4 ply - 11 x 18 3/4
K Support Strips (4)	3/4 x 3/4 - 9 3/4

STORAGE CABINETS

L Back Panel (1)	3/4 ply - 17 1/2 x 23
M Corner Strips (8)	3/4 x 1 1/2 - 23
N Narrow Rails (4)	3/4 x 1 - 17 1/2
O Bottom Rail (1)	3/4 x 4 - 17 1/2
P Wide Rail (1)	3/4 x 7 3/4 - 17 1/2
Q Side Panels (3)	3/4 ply - 19 1/4 x 23
R Right Side Panel (1)	3/4 ply - 19 1/4 x 16
S Lower Rail (1)	3/4 x 3 - 19 1/4
T Bottom Panels (2)	3/4 ply - 18 3/4 x 19

U Top Stiles (4)	3/4 x 3 - 14 3/4
V Top Rails (4)	3/4 x 3 - 20
W Top Panels (2)	3/4 ply - 14 1/2 x 14 3/4
X Cleats (4)	3/4 x 3/4 - 18 3/4
Y Side Aprons (2)	3/4 x 3 - 20 1/4
Z Front/Bk. Aprons (2)	3/4 x 3 - 58 1/4

CASTER SYSTEM

AA Caster Block (2)	1 1/2 x 6 - 18 3/4
BB Lever Arms (2)	3/4 x 3 - 13
CC Stops (2)	1/2 dowel x 1 3/4
DD Keeper Blocks (2)	1 1/2 x 1 3/4 - 5

DRAWERS

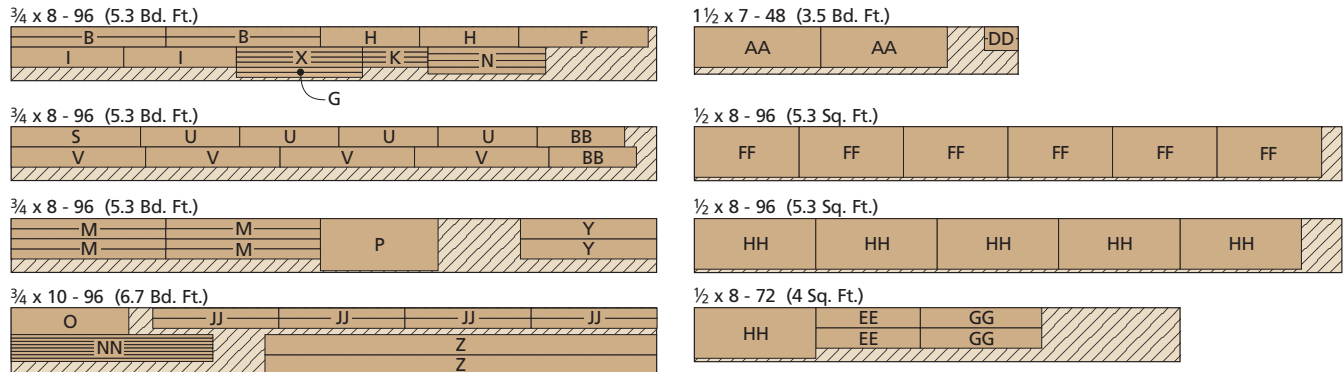
EE Small Fronts/Backs (2)	1/2 x 3 - 15 1/2
FF Deep Fronts/Backs (6)	1/2 x 7 1/2 - 15 1/2
GG Small Sides (2)	1/2 x 3 - 18
HH Deep Sides (6)	1/2 x 7 1/2 - 18
II Drawer Bottoms (4)	1/4 hdbd. - 15 1/2 x 17 1/2
JJ Spacers (8)	3/4 x 1 1/2 - 18 3/4
KK Small False Front (1)	3/4 ply - 3 3/4 x 17 1/2
LL Mdl. Cab. False Fr. (2)	3/4 ply - 9 x 17 1/2
MM End Cab. False Fr. (1)	3/4 ply - 10 1/2 x 17 1/2

NN Edging	1/2 x 3/4 - 216 in. in.
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HARDWARE SUPPLIES

- (1) No. 4 x 1/2" Rh woodscrew
- (32) No. 6 x 1/2" Fh woodscrews
- (16) No. 8 x 3/4" Fh woodscrews
- (16) No. 8 x 1" Fh woodscrews
- (172) No. 8 x 1 1/4" Fh woodscrews
- (4) No. 8 x 1 1/2" Fh woodscrews
- (16) No. 14 x 5/8" Ph sheet-metal screws
- (4) Leg levelers
- (4) 3" swivel casters
- (4) 5 1/2" drawer pulls
- (4 pr.) 18" drawer slides
- (4) 1/2" x 5" lag screws
- (2) 1/2" x 3" hex-head bolts
- (4) 1/2" washers
- (2) 1/2" lock nuts w/ nylon inserts
- (1) 4"-dia. x 24" metal duct pipe
- (1) 90° metal duct elbow
- (2) 4" hose clamps
- (38) No. 18 x 5/8" wire nails

CUTTING DIAGRAM



NOTE: ALSO NEED TWO 48" x 96" SHEETS OF $\frac{3}{4}$ " PLYWOOD, ONE 48" x 48" PIECE OF $\frac{1}{4}$ " HARDBOARD FOR PART II, AND ONE 6" PIECE OF $\frac{1}{2}$ " DOWEL FOR PART CC

TABLE SAW CABINET

Start by building the end cabinet. It's a plywood box with solid wood corners and an open frame top (*Fig. 1*).

SIZE. The first step is to determine the size of the cabinet. It's designed to fit flush with the metal housing on the table saw. So I just measured the width and depth of the housing and then sized the cabinet accordingly.

Another thing to consider is the height of the cabinet. The height of the cabinet shown here is 24 $\frac{1}{2}$ " (with levelers). This puts the working height of my saw at 37".

Note: You may want to modify the height of the cabinet to provide a more comfortable working height.

FRONT AND BACK. Once the size is established, the first step is to make the front and back of the cabinet. They're both made up of a plywood front and back panel (A) with a hardwood corner strip (B) applied to each vertical edge (*Fig. 2*).

TONGUE AND GROOVE. These pieces are assembled with tongue and groove joints. This requires cutting a tongue on two edges of the front and back panels (*Fig. 2*). To accept these tongues, you'll also need to cut a centered groove in the edge of each corner strip.

There's also an off-center groove in the face of the strip for a tongue that's cut later on the sides. It's best to cut this groove after the tongue is made on the sides.

DUST PORT. Next, I cut a large hole in the back (*Fig. 2*). This hole is sized to accept a 4"-dia. metal pipe. (To build an optional dust bin, see the Designer's Notebook on the next page.)

SIDES. Now you're ready to add the two sides. One thing to note here is the left side (C) is shorter than the right (D) (*Fig. 3*). When the cabinet is assembled

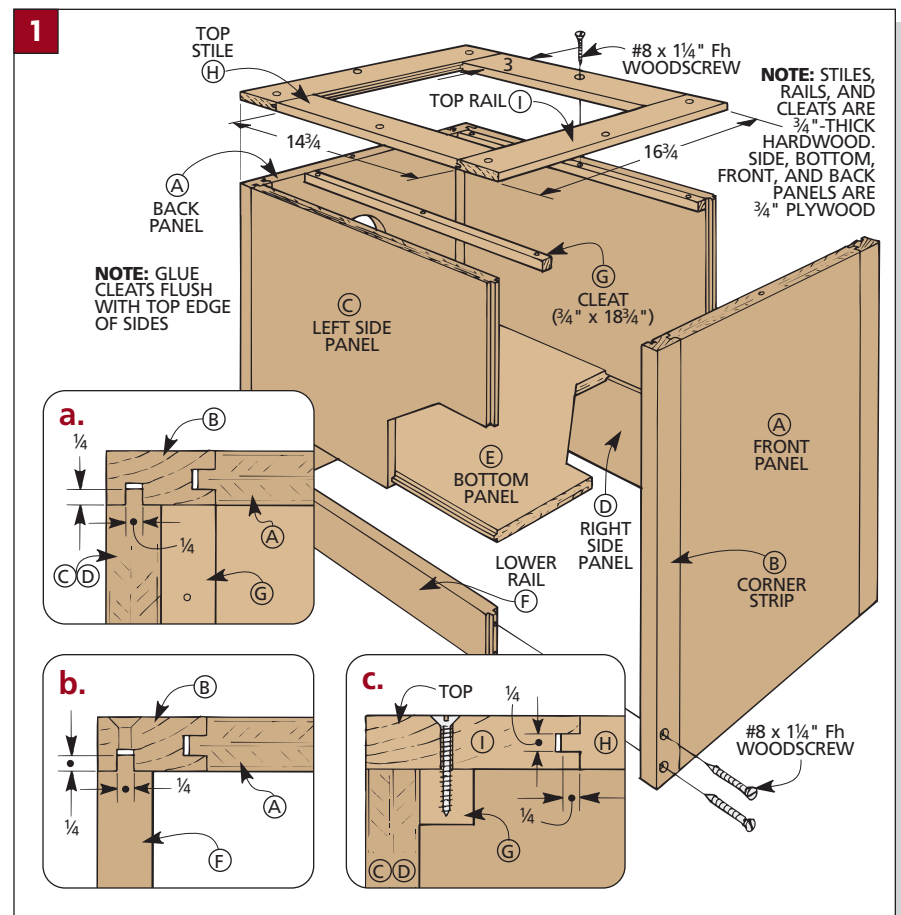
later, the short side helps to form an opening at the bottom of the cabinet that provides access to the caster system.

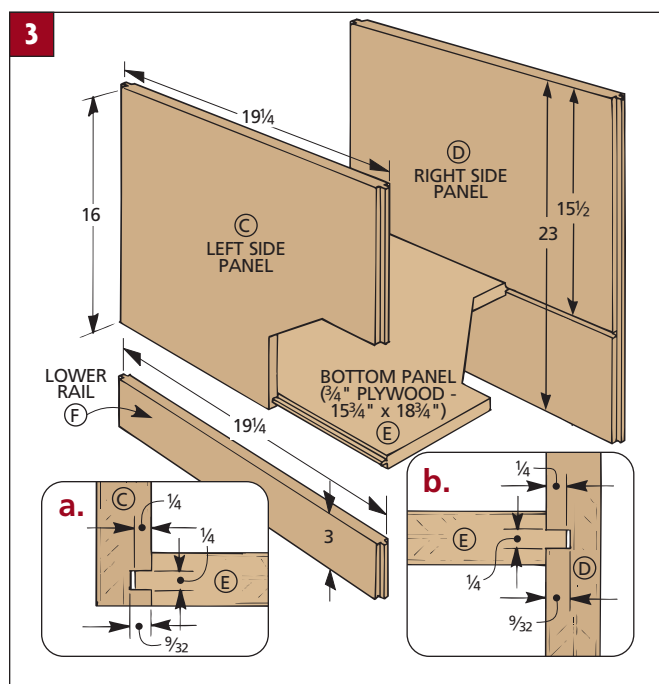
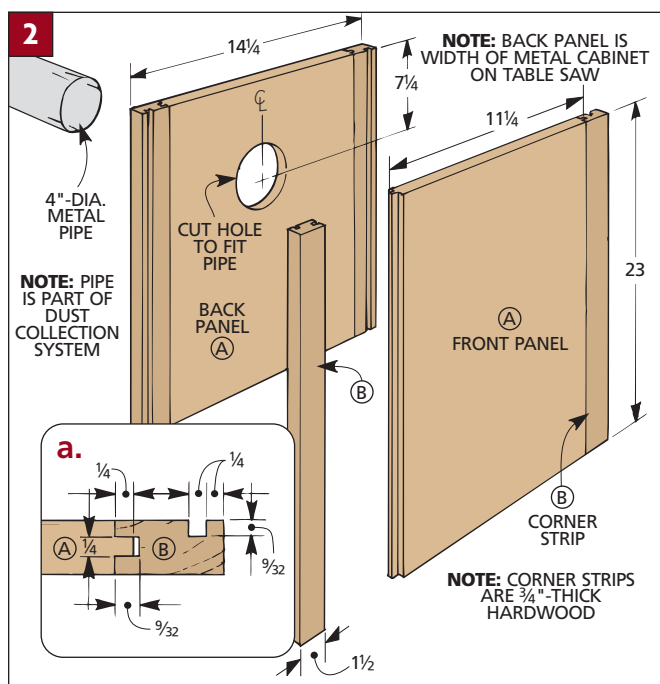
Again, there's a tongue on the two vertical edges of each side. Once the tongue is made, you can cut the off-center groove in the corner strip to fit it.

BOTTOM. The next step is to add a plywood bottom (E) (*Fig. 3*). Here again, there's a tongue on two edges of this piece (*Figs. 3a and 3b*). Only this time, they fit into a dado cut in each side piece.

LOWER RAIL. Before assembling the cabinet, I made a lower rail (F) to add rigidity to the cabinet (*Fig. 3*). It also helps create the opening for the casters. The rail fits into the grooves in the corner strips. This requires cutting a short (stub) tenon on each end of the rail (*Fig. 1b*).

ASSEMBLY. Now you can glue and clamp the cabinet together. Two screws in each end strengthen the lower rail. And a pair of hardwood cleats (G) glued to the sides, provide a way to secure the top.





TOP. The top of the Table Saw Workstation cabinet is nothing more than an open wood frame that allows dust and chips to fall inside the cabinet. It consists of $\frac{3}{4}$ "-thick hardwood stiles (H) and top

rails (I) that are sized so the frame fits flush with the outside of the cabinet.

The frame pieces are assembled with stub tenon and groove joints. This means cutting a groove in the inside edge of the

rails only and a short (stub) tenon on both ends of each stile (Fig. 1c).

After gluing up the top, don't attach it just yet. This will make it easier to install the dust collection system added next.

DESIGNER'S NOTEBOOK

This optional dust bin makes it easy to remove dust and chips if you don't have a dust collection system.

SAWDUST BIN

■ This optional Sawdust Bin slides into an opening in the cabinet to provide a simple alternative if you don't have a dust collector in your shop.

MATERIALS LIST

CHANGED PARTS

P	Wide Rail (2)	$\frac{3}{4}$ x $7\frac{3}{4}$ - 17 $\frac{1}{2}$
FF	Deep Fr./Bk. (8)	$\frac{1}{2}$ x 7 $\frac{1}{2}$ - 15 $\frac{1}{2}$
HH	Deep Sides (8)	$\frac{1}{2}$ x 7 $\frac{1}{2}$ - 18
II	Drawer Bottoms (5)	$\frac{1}{4}$ hdbd. - 15 $\frac{1}{2}$ x 17 $\frac{1}{2}$

LL	Mdl. Cab. False Fr. (3)	$\frac{3}{4}$ ply - 9 x 17 $\frac{1}{2}$
NN	Edging	$\frac{1}{2}$ x $\frac{3}{4}$ - 54 in. in.

NEW PARTS

OO	Top Rail (1)	$\frac{3}{4}$ x 5 $\frac{1}{4}$ - 17 $\frac{1}{2}$
PP	Drawer Guides (2)	$\frac{1}{2}$ x 1 $\frac{1}{2}$ rgh. - 18

Note: Quantities include everything needed to build deep drawers in storage cabinets.

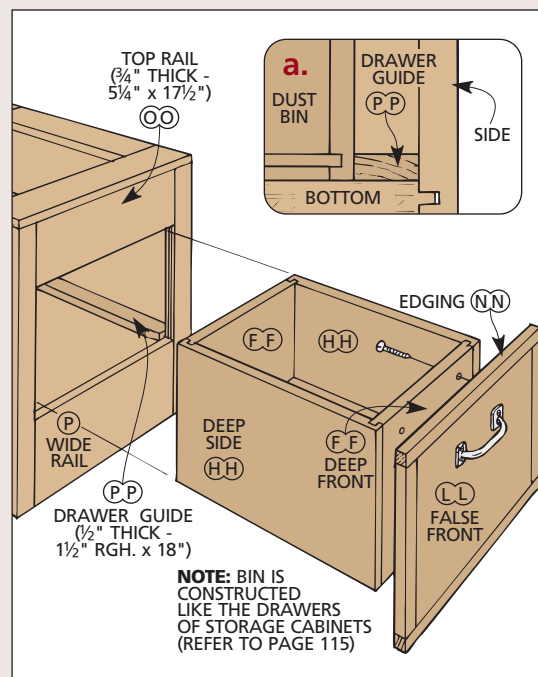
HARDWARE SUPPLIES

- (4) No. 8 x 1" Fh woodscrews
- (1) 5 $\frac{1}{2}$ " pull

■ To make room for the dust bin, you'll first need to build a slightly different face frame for the front of the table saw cabinet. Instead of a front panel (A), I installed a top rail (OO) at the top of the opening and a wide rail (P) at the bottom (see drawing).

■ Next, build a deep drawer like those that are used in the storage cabinets you'll be building later (refer to page 115). Then attach a false front (LL) to this drawer.

■ With the new face frame and drawer complete, I glued a pair of solid-wood drawer guides (PP) on the cabinet bottom. These runners are sized to guide the bin in and out, keeping it centered in the opening (see detail 'a').



DUST COLLECTION SYSTEM

With the outside of the table saw cabinet complete, you can now turn your attention to the dust collection system housed inside the cabinet.

The system includes a large, V-shaped trough that's covered with a thin sheet of metal (*Fig. 4*). This creates a smooth, angled surface that directs chips and sawdust down through the bottom of the trough and into a dust collector.

Note: You could use a shop vacuum to collect the dust from your saw (you'll need to resize the connections to fit), but I prefer a dust collector that is properly sized to handle the large amount of chips and dust produced by my table saw.

BAFFLES. The angled sides of the trough are formed by two $\frac{3}{4}$ " plywood baffles (J) (*Fig. 5*). Each baffle is held in place by a pair of $\frac{3}{4}$ "-thick hardwood support strips (K) attached to the front and back of the cabinet.

The important thing is the location of the support strips. The goal is to position the strips so the top of each baffle is flush with the edge of the hole in back of the cabinet (*Fig. 5a*). This will create a smooth transition from the baffles to the hole when the metal covering is added.

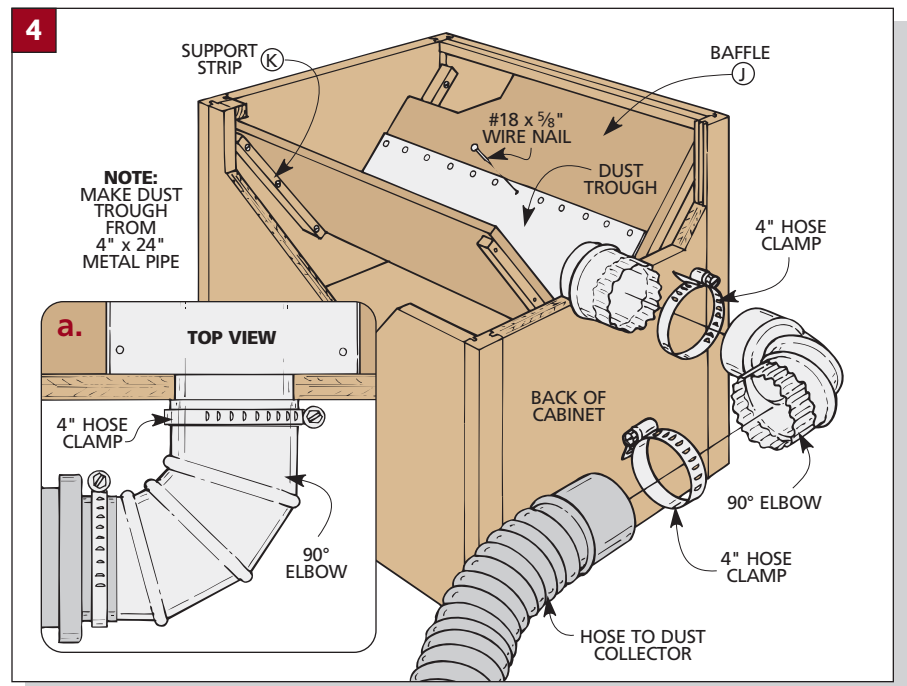
Once you've established the location of the support strips, they're fastened to the front and back of the cabinet with glue and screws. When that's complete, simply glue and screw the baffles to the support strips (*Fig. 5a*).

METAL COVERING. At this point, there's still an opening at the bottom of the trough between the baffles. That's where the sheet metal covering comes in. It bridges the opening between the baffles and forms a smooth, U-shaped surface across the lower part of the system.

METAL PIPE. This metal covering is actually just a piece of 4"-dia. metal duct pipe. (I picked up a 24"-long piece of snap-together pipe at a home center.)

This type of pipe is crimped at one end. To create a hook-up for the hose from the dust collector, a short length of the pipe near the crimped end forms a "neck" that sticks out the back of the cabinet. The remaining part of the pipe is spread apart like a baked potato to create two flaps that will lie flat on the baffles (see the photo on the next page).

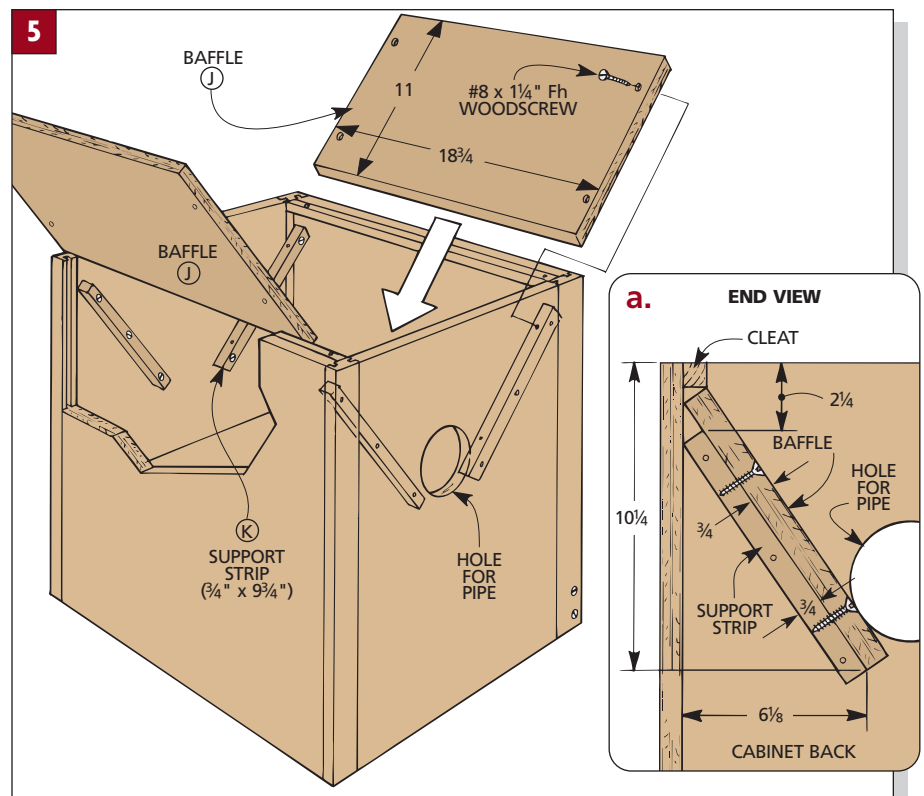
TRIM PIPE. But first, you may need to trim the duct pipe to length. The final length of the pipe depends on the depth of the cabinet. The best way I found to



determine this length is to test fit the pipe in the cabinet.

Note: It's tempting to snap the duct pipe together to do this. There's only one problem. When it comes time to cut the two flaps, it would be really difficult to pull the pipe back apart. The solution, then, is to roll the pipe into a tight cylinder and hold it together with masking tape.

Now slide the tightly-wrapped cylinder of pipe through the hole until it contacts the front of the cabinet (*Fig. 6*). With the pipe in this position, measure the distance from the back of the cabinet to the external "rib" near the crimped end. This is the amount you want to remove. (Just be sure to remove the pipe and trim the end that's not crimped.)



LAY OUT FLAPS. The next step is to lay out the cut lines on the pipe for the two wide flaps. To do this, start by slipping the pipe all the way back into the cabinet (with the seam facing up). Then draw a line about a third of the way around both sides of the pipe (*Fig. 7*).

CUT FLAPS. After removing the pipe again, a pair of tin snips makes quick work of cutting the flaps (*Fig. 8a*). (Be careful though. You may want to wear gloves, because the edges can be very sharp.) Once the flaps are cut, it's a good idea to trim off the locking tabs along the long edges of the pipe. And you only want to cut the tabs off the portion of the pipe with the flaps. This helps to create a smooth transition from the metal covering to the baffles. This will also prevent slivers of wood and dust from catching on the edges.

INSTALL COVERING. Now that the pipe is cut, you can snap the locking tabs on the crimped end together and install the

metal covering. To do this, roll up the metal flaps so they fit through the hole in the back of the cabinet. Then spread out the flaps on the baffles.

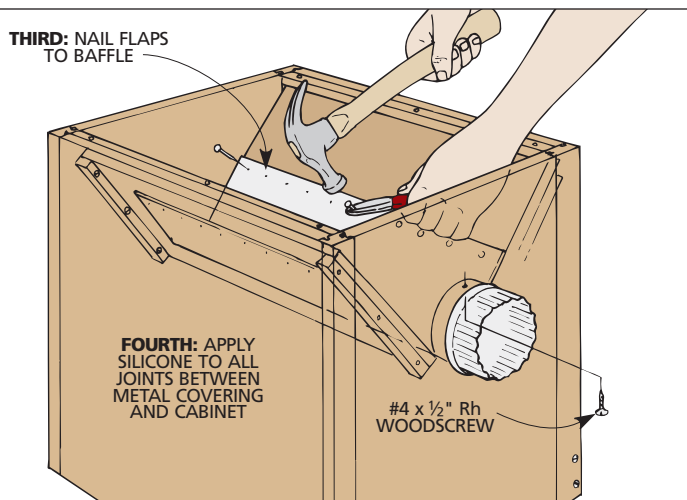
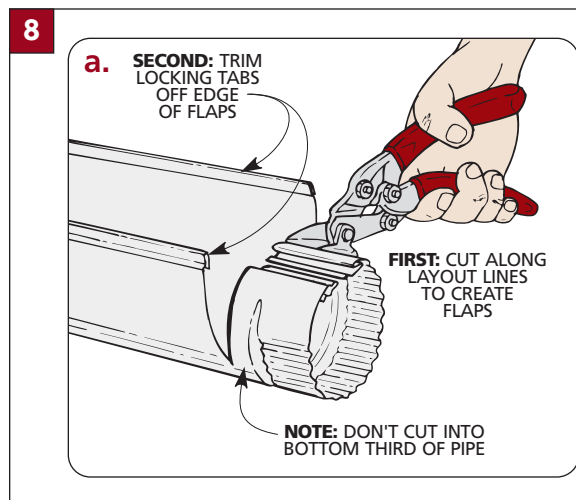
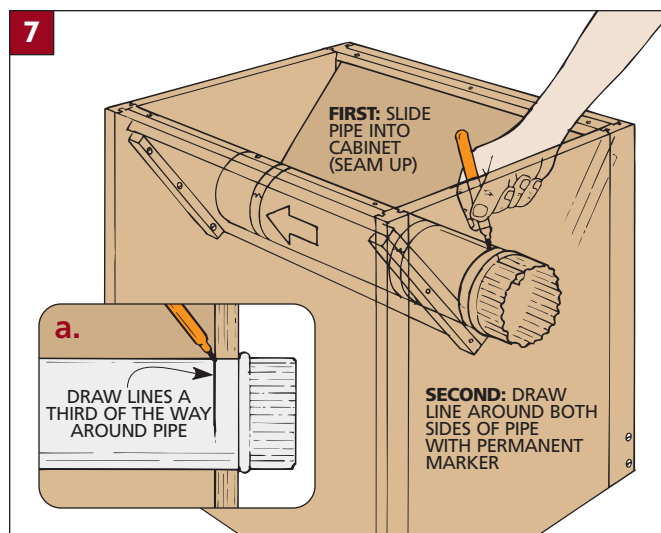
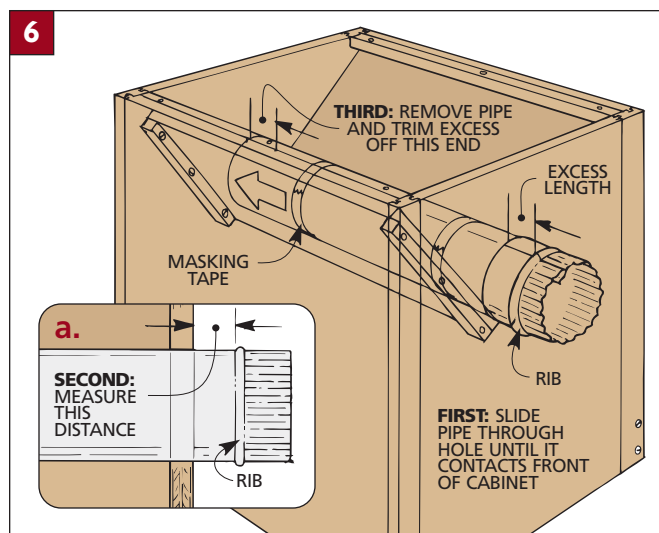
The flaps will have a tendency to curl up, so getting them to lie flat is a challenge. A little help from a friend will save a lot of frustration when it comes to pressing the flaps down flat on the baffles. To avoid any ripples in the edge, I nailed the flaps about 1" apart, working from one end to the other (*Fig. 8*).

After nailing the second flap in place, I screwed the neck of the pipe to the cabinet. Also, applying a bead of silicone wherever the metal covering meets the cabinet will prevent dust from escaping.

DUST COLLECTOR HOOK-UP. All that's left is to install the fittings used to hook up the hose from the dust collector. I tightened a 90° elbow onto the pipe with a hose clamp (*Figs. 4 and 4a*). This way, the hose will run along the back of the table saw cabinets.



It's easy to make the metal covering for the dust trough. Start with a 4"-dia. metal pipe (top) and then cut two wide flaps, leaving the bottom third uncut (bottom).



STORAGE CABINETS

At this point, the table saw cabinet portion of the workstation is almost complete. It still needs a set of casters, which I'll get to later. But first, to provide storage for tools and accessories, I built a couple more units with drawers: a middle cabinet and an end cabinet (*Fig. 12*).

The middle and end cabinets are similar to the table saw cabinet. But there are

a couple of differences between them that are worth noting.

First of all, there's a face frame on the front of each cabinet that forms two drawer openings. Plus, the upper part of each cabinet is completely enclosed. This creates a handy storage area on top of the cabinets once they're fastened together.

Just one more note. The end cabinet houses the second half of the caster system. To provide clearance for the

casters, the bottom of this cabinet sits higher than the middle one.

CABINET SIZE. The first step is to determine the overall size of the cabinets. They're identical in height and depth to the cabinet that holds the table saw. But these cabinets are a little wider.

The combined width of the cabinets equals the distance from the end of the rip fence rail to the metal saw cabinet, less 1". This way the router table extension (added later) will overhang the end cabinet slightly. The width of each cabinet ends up being half that distance.

CONSTRUCTION

Since these cabinets are similar to the one that holds the table saw, construction goes pretty quickly.

CABINET BACKS. Take the back of each cabinet, for instance. As before, the cabinet backs are made up of a $\frac{3}{4}$ " plywood back panel (L) and two $\frac{3}{4}$ "-thick hardwood corner strips (M) (*Fig. 9*). Here again, these pieces are assembled with tongue and groove joints (*Fig. 9a*).

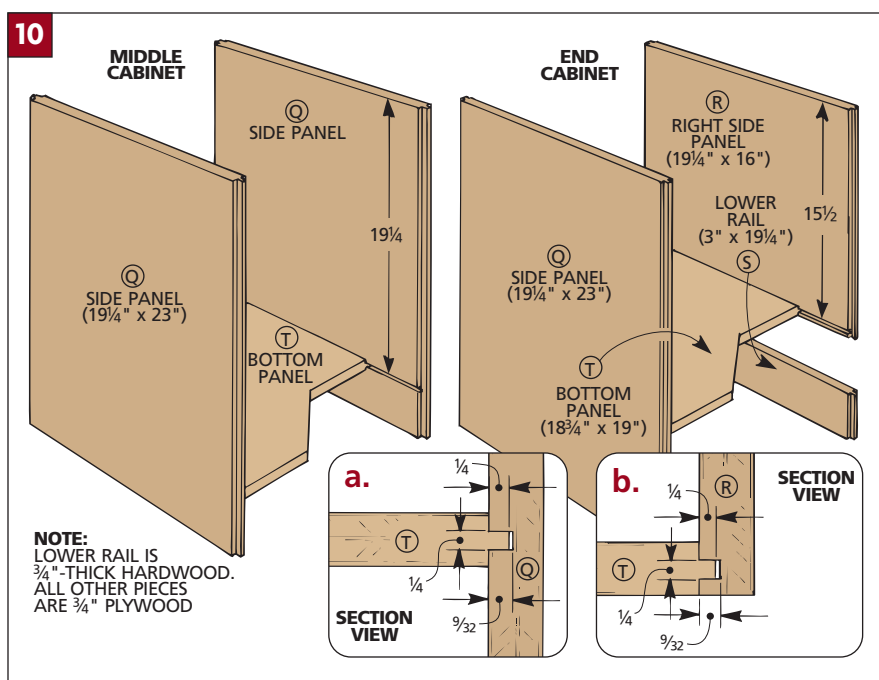
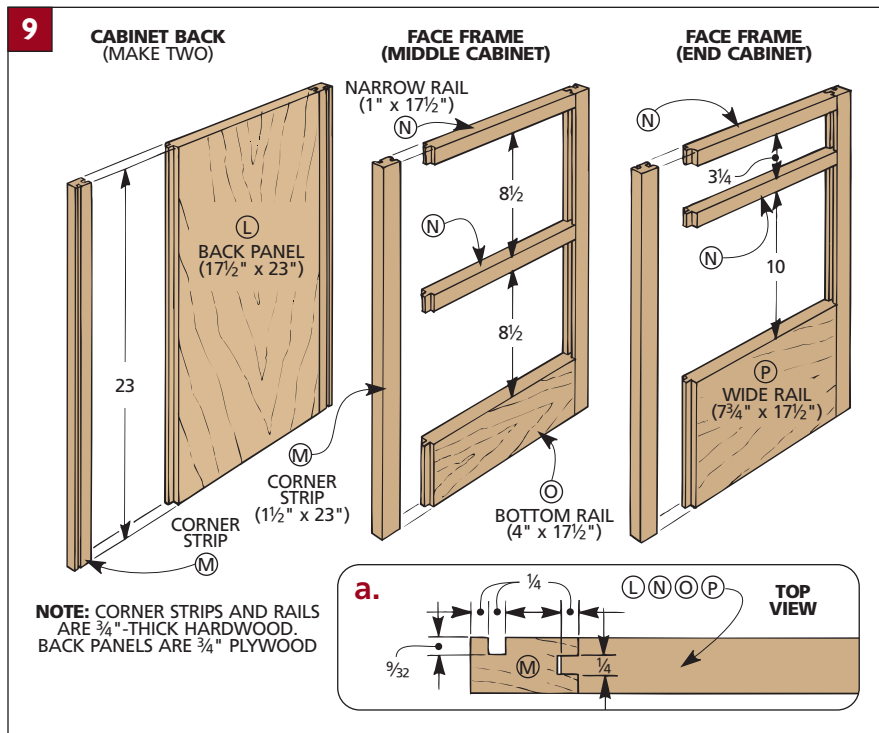
FACE FRAMES. The face frames that form the fronts of the cabinets start out just like the back — with two corner strips (M) (*Fig. 9*). The only difference is that they're connected by hardwood rails instead of a plywood panel.

These rails form the drawer openings. To hold a pair of deep drawers, I made two identical openings in the middle cabinet using a pair of narrow rails (N) and a bottom rail (O). And for storing larger items, I made an even taller opening in the face frame for the end cabinet with two narrow rails (N) and a wide rail (P). There's also a small opening on top of this cabinet for a shallow drawer.

The face frames are assembled with stub tenon and groove joints (*Fig. 9a*). This requires cutting a stub (short) tenon on both ends of each rail and a groove in the edge of the corner strips.

SIDES. Next, add the sides. Three of the sides (Q) are identical (the two sides of the middle cabinet and the left side of the end cabinet) (*Fig. 10*). But once again, to form the opening that provides access to the casters, the right side (R) of the end cabinet is shorter, and a hardwood lower rail (S) spans the bottom.

Now, the side panels and corner strips are assembled with tongue and groove joints. And again, I used a tongue and dado joint to fit a plywood bottom (T) into the sides (*Figs. 10a and 10b*).



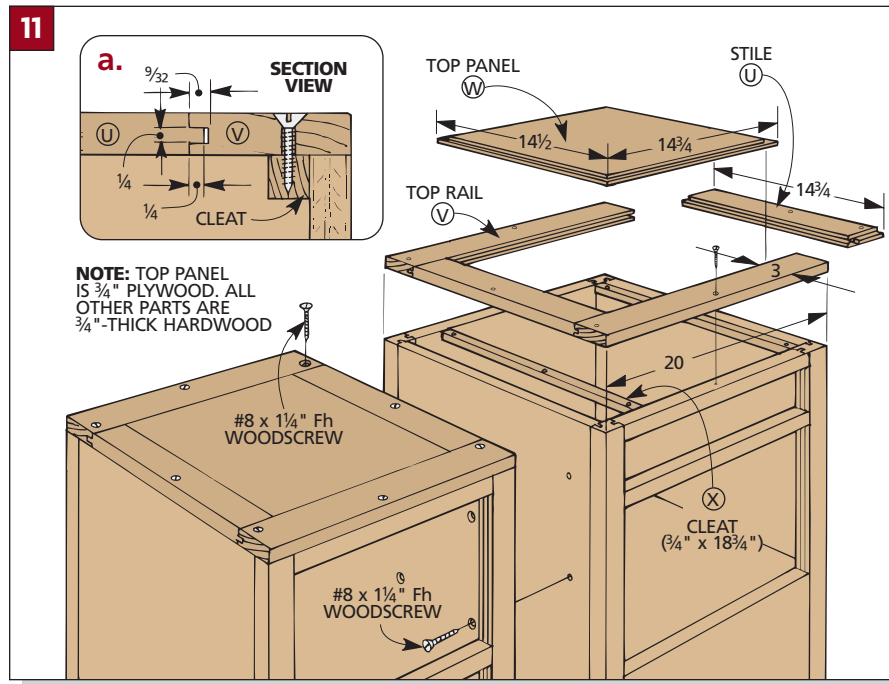
Note: To provide clearance for the casters, don't forget to locate the dadoes in the sides of the end cabinet *closer* to the top edge (Fig. 10).

ADD THE TOPS. After gluing up each cabinet, you can turn your attention to the tops. Each top starts out as a solid-wood frame made up of two top stiles (U) and rails (V) (Fig. 11). These pieces are held together with stub tenon and groove joints. But this time, you'll need to cut a groove in each frame piece. These grooves accept tongues that are cut on all four edges of a top panel (W).

CHAMFERS. After gluing up the tops, I routed a $\frac{1}{16}$ " chamfer around the top edges of each frame as well as the four corners of each cabinet. The chamfers create a "shadow line" when the cabinets are joined together. This way, if the cabinets don't match perfectly, the shadow lines make it less noticeable.

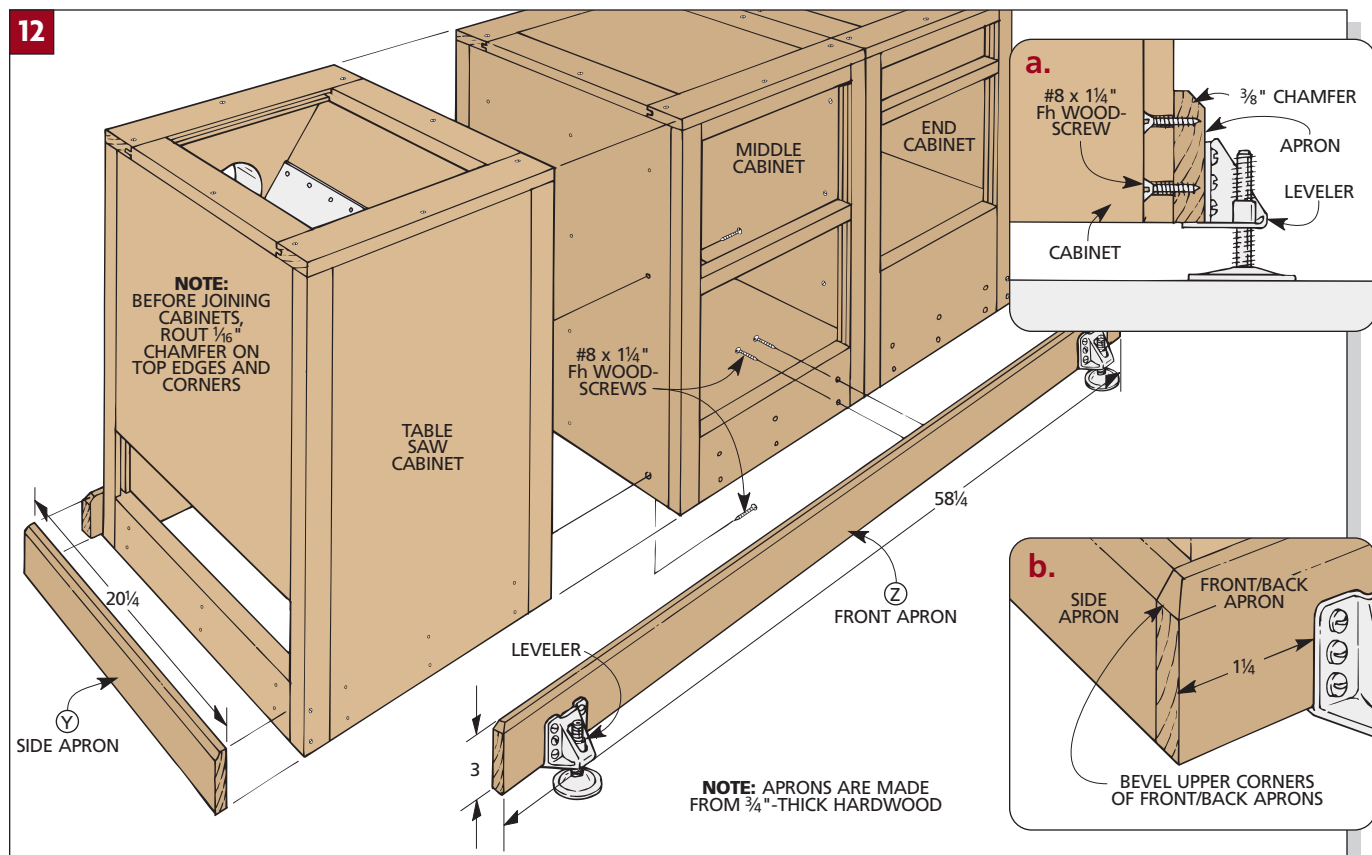
JOIN CABINETS. To join the three cabinets together, drive screws from inside the middle cabinet into each of the end cabinets (Fig. 12). Then, after gluing a cleat (X) to the sides of the middle and end cabinets (Fig. 11), the tops can be screwed in place.

APRON. Next, to add rigidity to the base of the cabinets, I "wrapped" a wide,



hardwood apron around them (Fig. 12). After routing a chamfer on the top edge of the side (Y), front (Z), and back (Z) apron pieces, they're screwed to the cabinets from the inside (Fig. 12a). I also beveled all four corners with a hand plane to match the chamfers (Fig. 12b).

LEVELERS. Now all that's left is to mount a set of four heavy-duty levelers to the front and back aprons near the ends of the cabinet (Fig. 12a). The levelers support the workstation when the casters (installed later) aren't being used. (For sources of levelers, see page 126.)



CASTER SYSTEM

As you'd expect, the casters on the cabinets make it easy to roll the workstation around. But they're only one part of a caster system. To create a solid, stable work surface, this system lets you lower the cabinets *off* the casters and onto the levelers you installed earlier.

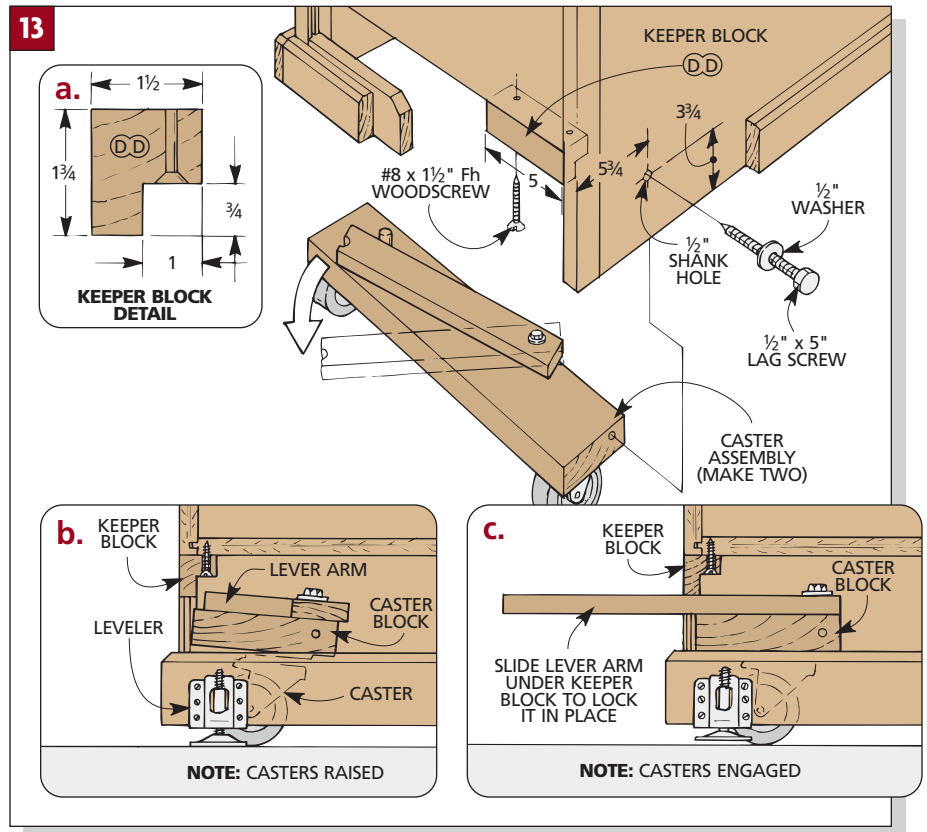
CASTER ASSEMBLIES. To make this work, there are two separate caster assemblies—one inside each end of the workstation (*Fig. 13*).

The casters in each assembly are mounted to a thick block that pivots up and down. This caster block is tilted at an angle when the workstation is resting on the levelers (*Fig. 13b*). In this position, the casters just “touch” the floor which prevents the workstation from moving.

To engage the casters, you simply swing a wood lever arm out of the cabinet, step down on it, and slide it under a keeper block. This lifts the workstation off the levelers (and onto the casters) so you can roll it around (*Fig. 13c*).

CASTER BLOCKS. I began by making two 1½"-thick hardwood caster blocks (AA) (*Fig. 14*). They're cut to length to fit snug (not tight) inside the cabinets so the blocks can pivot without binding.

To create a pivot point, the caster blocks are attached to the cabinet with a



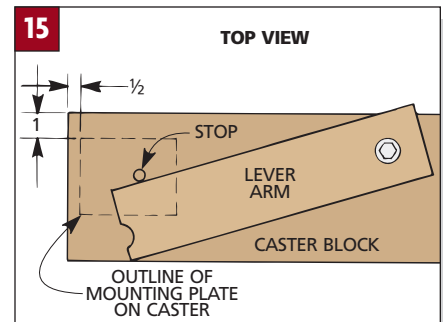
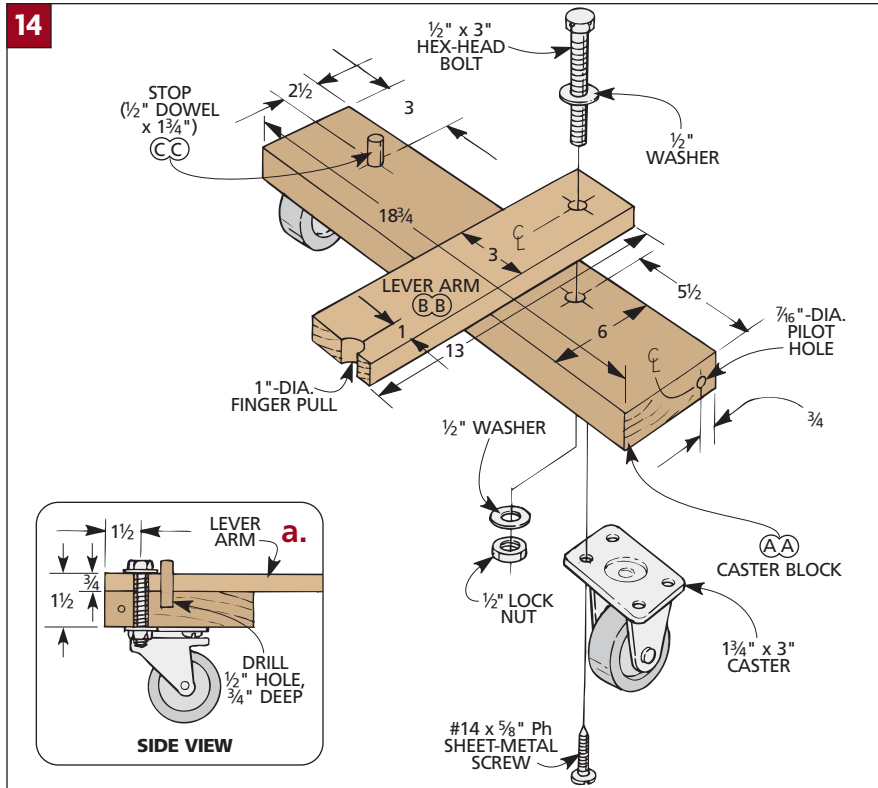
single lag screw at each end. Each lag screw passes through a shank hole in the cabinet and into a pilot hole in the end of the block (*Fig. 13*).

LEVER ARM. After drilling the holes for the pivot point, I added the lever arm (BB) that raises and lowers the caster assembly (*Fig. 14*). It's a piece of ¾"-thick hardwood with a circular notch cut in one end for a finger pull.

The lever arm is held in place with a hex-head bolt that passes through a hole in the arm and caster block (*Fig. 14*). Threading a lock nut onto the bolt so it's just snug secures the arm yet still allows it to swing back and forth.

STOP. To prevent the arm from swinging too far beneath the cabinet where it's hard to reach, I added a stop (CC). It's a short dowel that's glued into a hole in the caster block (*Fig. 14*).

KEEPER BLOCK. Before installing the caster assembly, I added a hardwood keeper block (DD) to lock the lever arm



in the “down” position (*Figs. 13 and 13c*). To provide clearance for the caster assembly, it’s rabbeted on one edge and then screwed to the cabinet.

INSTALL CASTERS. Now you can mount the casters (*Fig. 15*) and slip the assemblies inside the cabinet and secure them with lag screws. To prevent binding, just “snug” the screws against the cabinet.

DRAWERS

All that’s left to complete the cabinets is to add a set of four drawers.

To provide easy access to tools and supplies, each drawer is mounted on a pair of metal slides (*Fig. 16*). The drawer slides I used required $\frac{1}{2}$ " clearance on each side. So I built 16"-wide drawers (1" less than the width of the opening). As for length, they match the slides (18").

Another consideration is the height of the drawer. I made the shallow drawer 3" tall. To simplify construction, the deep drawers are all the same height ($7\frac{1}{2}$ ").

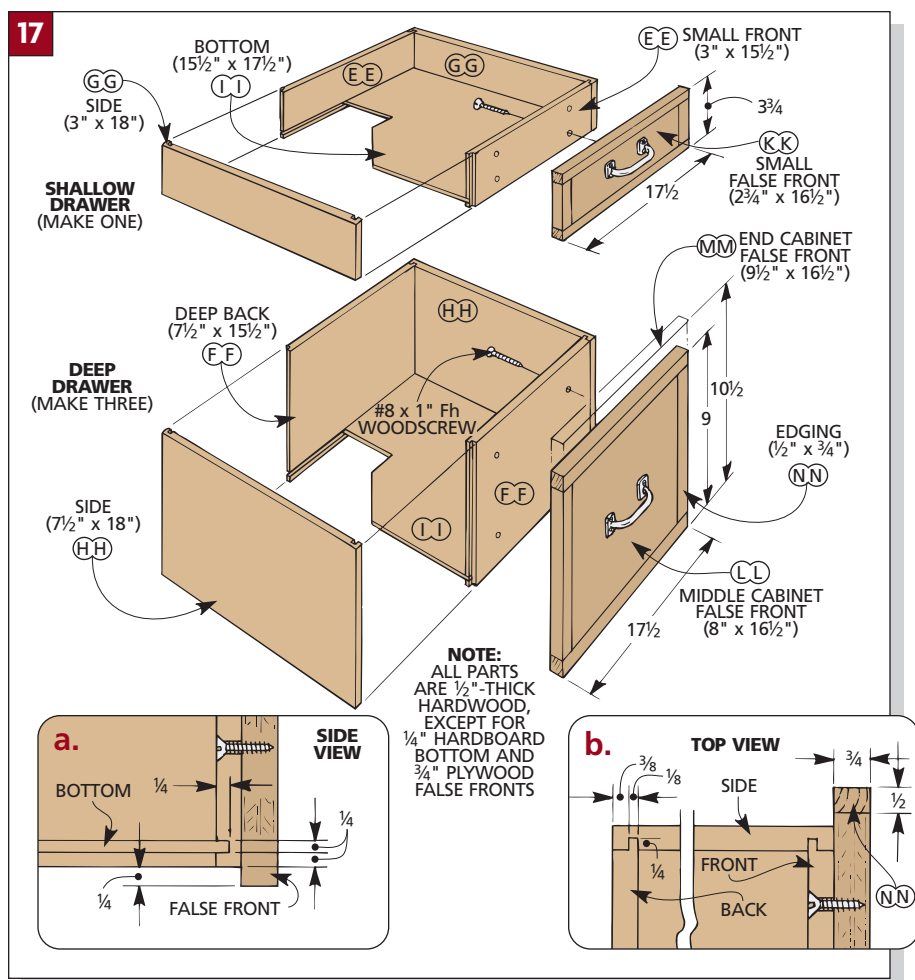
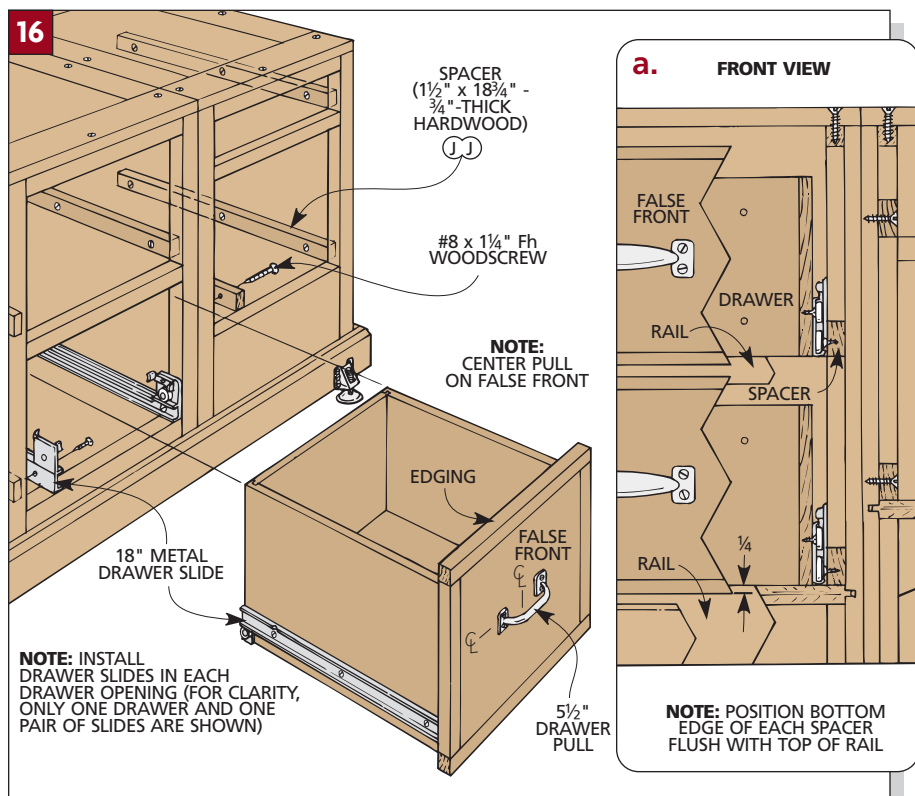
Note: The drawer that fits in the largest opening (in the end cabinet) will get a larger false front.

DRAWER CONSTRUCTION. The drawer front and back (EE, FF) pieces and sides (GG, HH) are made of $\frac{1}{2}$ "-thick hardwood (*Fig. 17*). After cutting the pieces to size, the fronts and backs are rabbeted at each end to form a tongue (*Fig. 17b*). This tongue fits into a dado in each side.

Before gluing up the drawers, you’ll need to cut a groove in each piece for a $\frac{1}{4}$ " hardboard bottom (II) (*Fig. 17a*). It’s also a good idea to drill countersunk shank holes in the drawer fronts now to make it easy to add the false fronts later.

DRAWER SLIDES. At this point, you’re ready to install the drawer slides. The slides are designed to be separated into two parts. One part is attached to the drawer side. The other is mounted to a hardwood spacer (JJ) that’s screwed to the cabinet sides (*Fig. 16a*). The spacers “build out” the side of the cabinet so it’s flush with the face frame.

FALSE FRONTS. All that’s left to complete the drawers is to add the small cabinet (KK), middle cabinet (LL), and end cabinet (MM) false fronts. These are pieces of $\frac{3}{4}$ " plywood trimmed with $\frac{1}{2}$ " thick, $\frac{3}{4}$ "-wide hardwood edging (NN). The goal is to size the false fronts so that once the edging is glued on, they overlap the drawer opening $\frac{1}{4}$ " all the way around (*Fig. 17a*). After screwing the false fronts in place, I added a pull on each drawer.

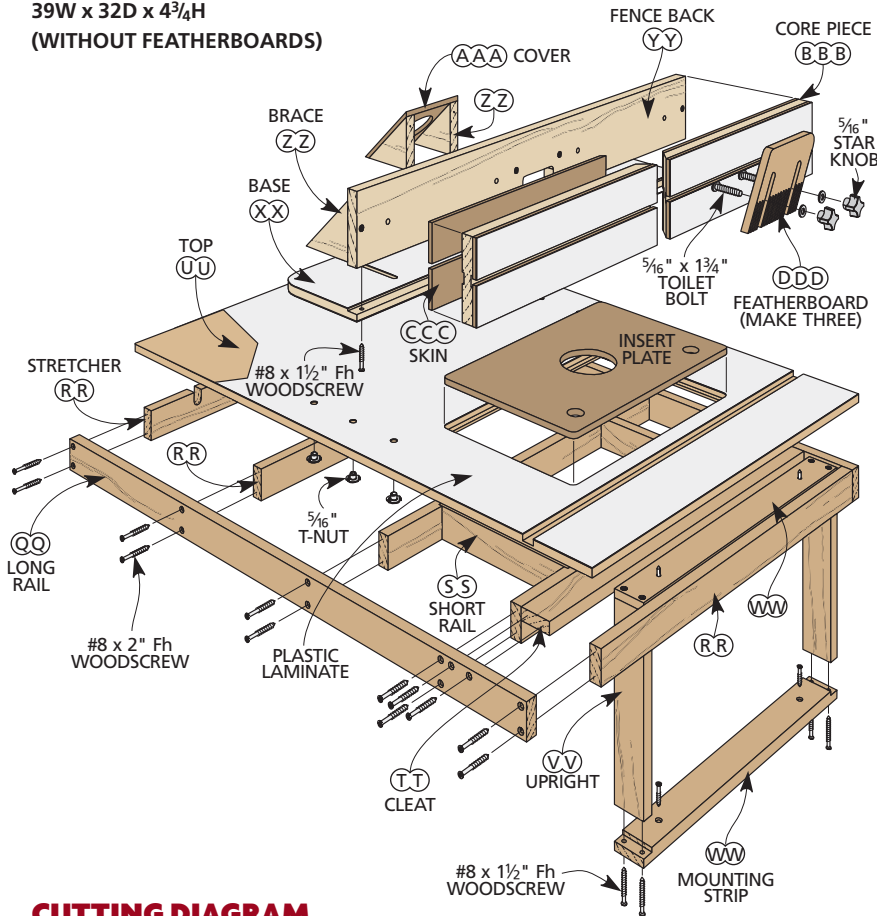


EXPLODED VIEW

OVERALL DIMENSIONS:

39W x 32D x 4³/₄H

(WITHOUT FEATHERBOARDS)

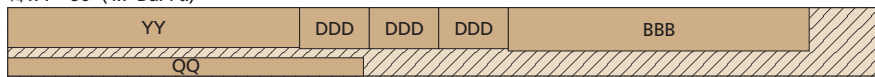


CUTTING DIAGRAM

3/4 x 8 - 96 (5.3 Bd. Ft.)



3/4 x 7 - 96 (4.7 Bd. Ft.)



NOTE: ALSO NEED ONE 36" x 48" PIECE OF 1/2" MDF FOR PARTS UU AND XX, AND ONE 24" x 24" PIECE OF 1/4" HARDBOARD FOR PARTS AAA AND CCC.

MATERIALS LIST

ROUTER TABLE EXTENSION

QQ	Long Rails (2)	$\frac{3}{4} \times 2 - 39$
RR	Stretchers (5)	$\frac{3}{4} \times 2 - 25\frac{1}{2}$
SS	Short Rails (2)	$\frac{3}{4} \times 2 - 10$
TT	Cleat (1)	$\frac{3}{4} \times 2 - 25\frac{1}{2}$
UU	Top (1)	$\frac{1}{2}$ MDF - 27×39
VV	Uprights (2)	$\frac{3}{4} \times 2 - 11\frac{1}{2}$ rough
WW	Mntg. Strips (2)	$\frac{3}{4} \times 2 - 20\frac{1}{4}$
FENCE		
XX	Base (1)	$\frac{1}{2}$ MDF - $6\frac{3}{4} \times 32$
YY	Fence Back (1)	$\frac{3}{4} \times 4\frac{3}{8} - 32$
ZZ	Braces (4)	$\frac{3}{4} \times 3\frac{1}{2} - 3\frac{1}{2}$
AAA	Cover (1)	$\frac{1}{4}$ hdbd. - $5 \times 57\frac{1}{16}$
BBB	Core Piece (1)	$\frac{3}{4} \times 4\frac{3}{4} - 33$
CCC	Skins (2)	$\frac{1}{4}$ hdbd. - $4\frac{3}{4} \times 33$

DDD Featherboards (3) $1\frac{1}{2} \times 4\frac{1}{2} - 7\frac{5}{8}$

HARDWARE SUPPLIES

- (4) No. 8 x $\frac{3}{4}$ " Fh woodscrews
- (4) No. 8 x $1\frac{1}{4}$ " Fh woodscrews
- (32) No. 8 x $1\frac{1}{2}$ " Fh woodscrews
- (32) No. 8 x 2" Fh woodscrews
- (6) $\frac{5}{16}$ " T-nuts
- (8) $\frac{5}{16}$ " x $1\frac{3}{4}$ " toilet bolts
- (8) $\frac{5}{16}$ " star knobs w/ through hole
- (2) $\frac{5}{16}$ " star knobs w/ $1\frac{1}{2}$ " threaded stud
- (8) $\frac{5}{16}$ " flat washers
- (2) $\frac{5}{16}$ " x $1\frac{1}{2}$ " fender washers
- (1) $10\frac{1}{4}$ " x $15\frac{1}{2}$ " insert plate ($\frac{3}{8}$ " phenolic)
- (1 pc.) Plastic laminate (48" x 48")

TABLE EXTENSION

Not many woodworkers complain that their shop is too big. But whether it's large or small, it's important to get the most efficient use out of the space that is available. That's what I like about this router table extension. It saves space by accomplishing two different jobs.

EXTENSION TABLE. First of all, it's a large extension table that provides extra support when ripping wide material on the table saw. That's just what I needed when I installed a new T-square style rip fence on my table saw. (To find sources of T-square rip fences, see page 126.)

Note: The extension table is a permanent replacement for one of the metal wings on the table saw.

ROUTER TABLE. To take advantage of the large worksurface, the extension table doubles as a router table. The router is mounted to an insert plate that fits in an opening in the table. This makes it easier to change bits. Plus, there's an adjustable fence that can be attached to the table (or removed) in seconds.

FRAME. To create a flat, solid work-surface, the router table is supported by a rigid frame that's made up of $\frac{3}{4}$ "-thick hardwood strips (*Fig. 18*).

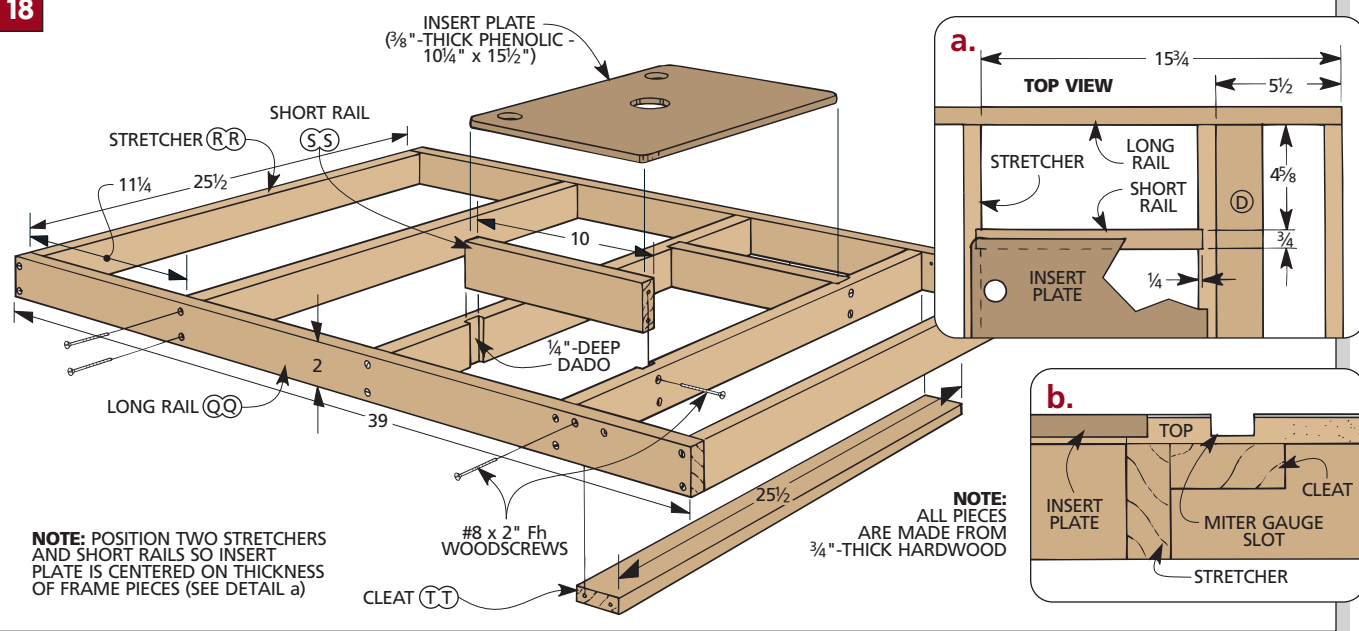
The overall width of this frame is determined by the front-to-back dimension of the metal wing on the table saw. (In my case, this was 27".) As for length, I wanted it to be flush with the end of the guide rail for the rip fence. (Mine is 39" long.)

The frame starts out as two long rails (QQ) connected by five stretchers (RR) (*Fig. 18*). Two of these stretchers work together with a pair of short rails (SS) to support the insert plate that holds the router. To lay out the location of these four pieces, you'll need the insert plate.

INSERT PLATE. I bought my plate with pre-drilled holes. It's made of 3/8"-thick phenolic which is a hard, rigid plastic that won't sag (see Sources, page 126).

LAYOUT. With the pre-drilled insert plate in hand, you can use it to establish the location of the two stretchers and a pair of dadoes that will hold the short rails. The goal is to have the edges of the insert centered on the thickness of these frame pieces (*Fig. 18a*).

ASSEMBLY FRAME. After cutting all the dados, the table frame is simply screwed together. I also screwed a cleat (TT) flush with the top edge of the frame. Later, this cleat helps “beef up” the area below the miter gauge slot in the table (*Fig. 18b*).



TOP. With the frame complete, the next step is to add the extension table top (UU) (Fig. 19). It's a large piece of $\frac{1}{2}$ " medium-density fiberboard (MDF) that fits flush with the outside of the frame.

For clearance when mounting the table, there are three shallow "pockets" underneath the top (Fig. 19). After using the existing mounting holes in the table saw to locate these pockets, a hand-held router and straight bit make quick work of cutting each recess.

You'll also need to cut three notches in the end of the frame that mounts to the table saw (Fig. 19a). The oversize notches allow the mounting bolts to pass through the frame.

After screwing the top to the frame, the top is covered with plastic laminate to create a smooth, durable worksurface. I used contact cement to glue on an oversize piece and then trimmed the edges with a router and flush trim bit.

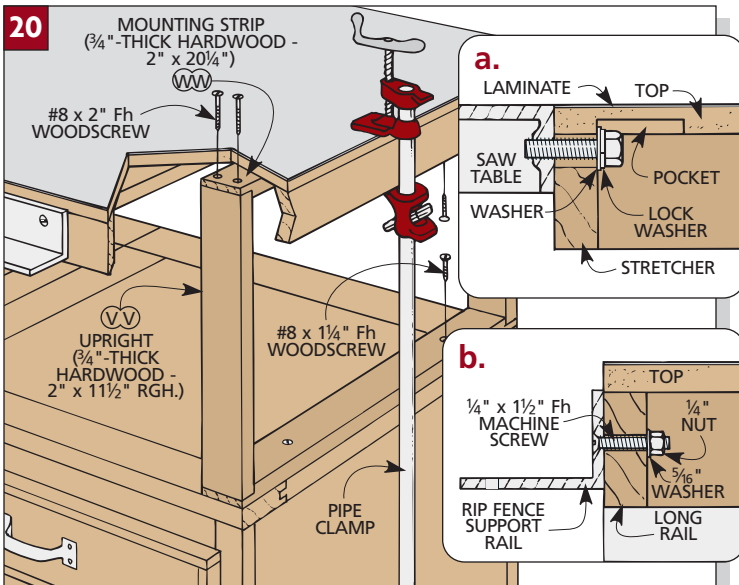
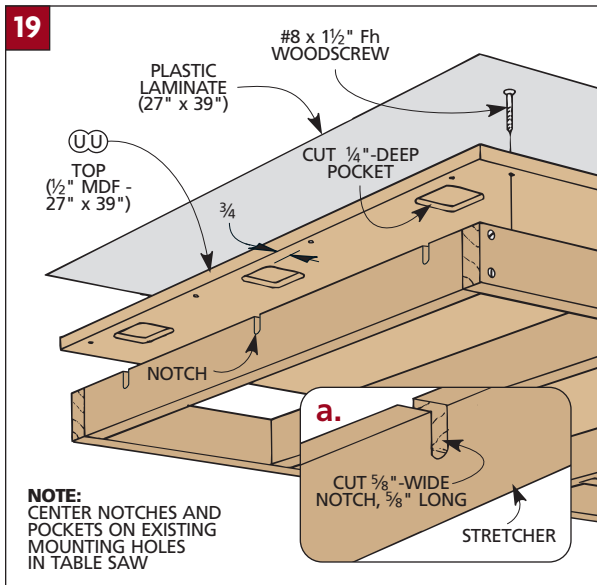
MOUNT EXTENSION TABLE. Now you're ready to mount the extension table to the saw. The goal is to make the surface of the table level with the cast iron saw table. Start by bolting one end of the table loosely to the saw (Fig. 20a). To hold up the other end of the table, I used a pipe clamp as a temporary prop (Fig. 20).

Note: You may need to shim the bottom end of the clamp with some scrap wood pieces to level the top.

After using a straightedge to check that both surfaces are level, tighten the mounting bolts. Then just attach the long metal support rails of the rip fence to the table with screws and nuts (Fig. 20b).

SUPPORT FRAME. The outside end of the table still needs to be supported. So I built a support frame to rest on the end of the cabinet (Fig. 20). It's just a pair of hardwood uprights (VV) and a couple of mounting strips (WW) that get assembled with rabbet joints and screws. The support frame is simply screwed to the cabinet and table (Figs. 20a and 20b).

Now you're ready to install the insert plate. The Technique article on the next page walks you through this.



TECHNIQUE Routing Openings



After mounting the extension table to the saw, I added the insert plate that holds the router. It fits in a recessed opening in the table (see photo above).

The only tricky part to adding an insert plate is cutting the recess. To prevent the plate from shifting, the insert plate has to fit the recess exactly.

ROUGH OPENING. To do this, start by cutting a rough opening (*Step 1*). Then trim the edges of the opening flush with

the frame pieces below it. Now you can rout the recessed lip for the insert plate.

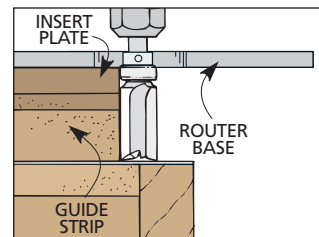
ROUT LIP. The secret to getting the outline of the lip to match the plate is to use the plate itself as a guide for positioning four guide strips (*Step 2*). The strips guide the bearing on a pattern bit as you rout the lip.

Note: The cutting edges of the pattern bit I used are 1" long. To provide a surface for the bearing to ride against, I glued up

SHOP TIP

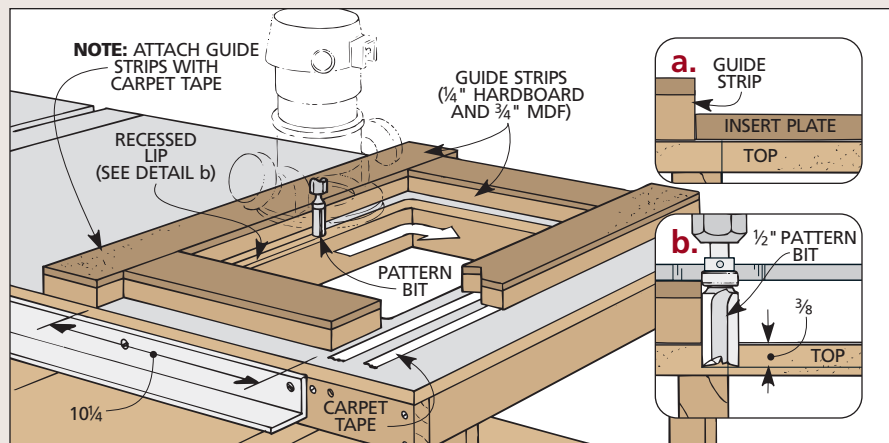
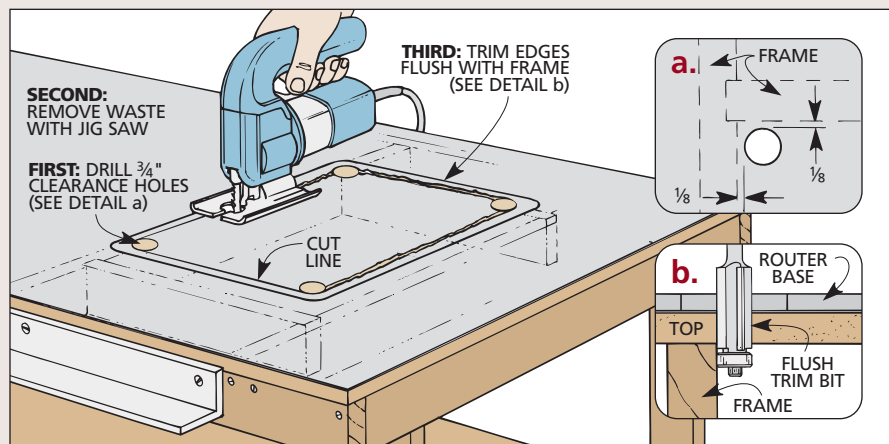
Bit Depth

To set the depth of cut, place the insert plate on a guide strip. Set the router on the plate and lower the bit until it barely touches the table.



a layer of $\frac{3}{4}$ " MDF with some $\frac{1}{4}$ " hardboard to make 1"-thick strips.

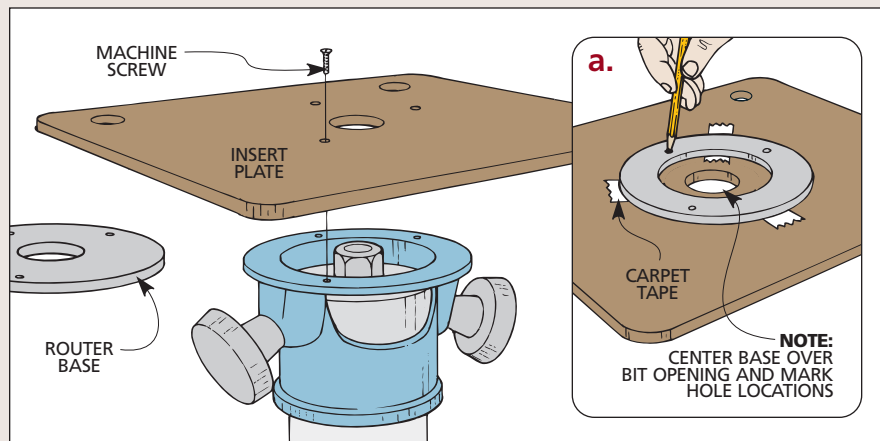
MOUNT ROUTER. After routing the lip, all that's left is to mount the router to the insert plate (*Step 3*).



1 To create the opening in the table for the insert plate, start by drilling a hole just inside each corner of the framed opening below it (see detail 'a'). Then after removing the waste with a jig saw, use a hand-held router and flush trim bit to trim the edges of the opening flush with the frame pieces (detail 'b').

2 The next step is to use a $\frac{1}{2}$ " pattern bit in a router to cut a recessed lip in the extension table. To do this, center the insert plate over the opening and butt the guide strips against it (detail 'a'). After adjusting the depth of cut (refer to the Shop Tip above), use the strips to guide the bearing on the bit as you rout in a clockwise direction (detail 'b').

3 All that's left is to attach the router to the insert plate. This requires drilling holes for the machine screws that hold it in place. An easy way to locate the holes is to use the existing base on your router (detail 'a'). And to keep the base from shifting around, I used some carpet tape to attach it to the insert plate.

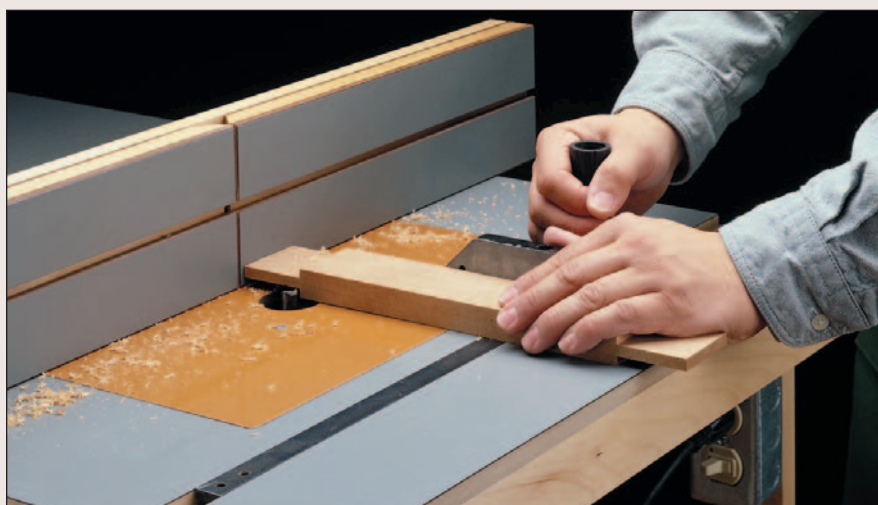


MITER GAUGE SLOT

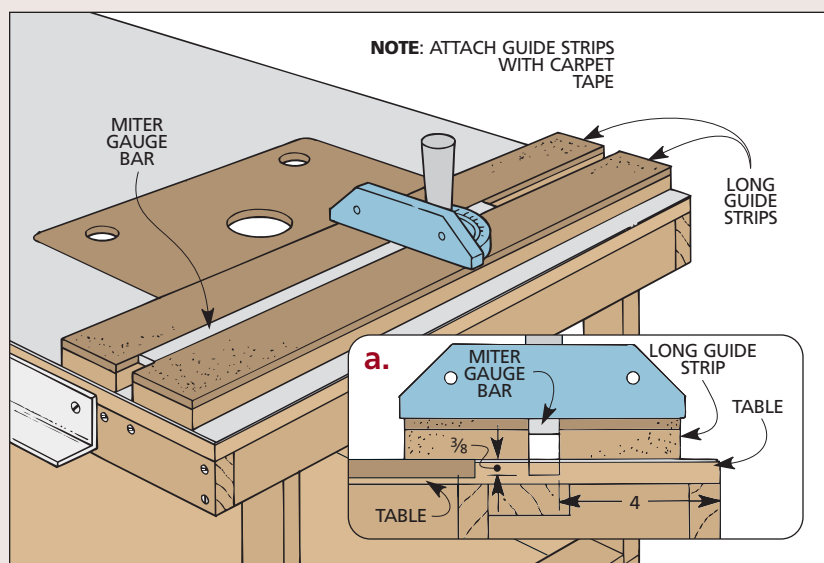
To produce accurate results, the bar of the miter gauge should slide smoothly in the slot without binding. Yet it should be snug enough that there's no "play" when you wiggle the head of the miter gauge.

GUIDE STRIPS. So to create a perfect fit for the bar, I used two long guide strips and a pattern bit mounted in the router. (These are the same two long guide strips used when routing the lip.) Only this time, the miter gauge bar is sandwiched between the two strips (Step 4).

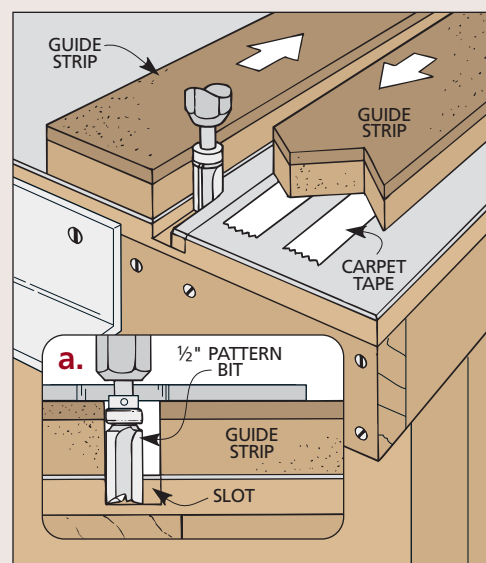
ROUT SLOT. With the strips in place, you can rout the slot. I set the depth of cut by placing the miter gauge bar on top of a guide strip, and the router on top of the bar. (Similar to the procedure used for the router plate.) Then lower the bit to barely touch the tabletop. Now remove the miter gauge and rout the slot (Step 5).



Miter Gauge Slot. The miter gauge from your table saw can be used on the router table to guide workpieces that have minimal bearing surface. The miter gauge slot should be properly sized to allow the miter gauge to slide smoothly without binding.



4 To establish the location of the miter gauge slot, fasten one guide strip 4" from the end of the table with some carpet tape (detail 'a'). Then position the second guide strip snugly against the miter gauge bar.



5 Using a pattern bit in a hand-held router, cut the miter gauge slot by making two passes, one against each guide strip.

FENCE SYSTEM

As soon as the table extension was completed and the insert and miter gauge slot were added, I set about building the router table fence system. It consists of two main parts: an L-shaped fence support that attaches to the router table and a pair of sliding faces (*Fig. 21*).

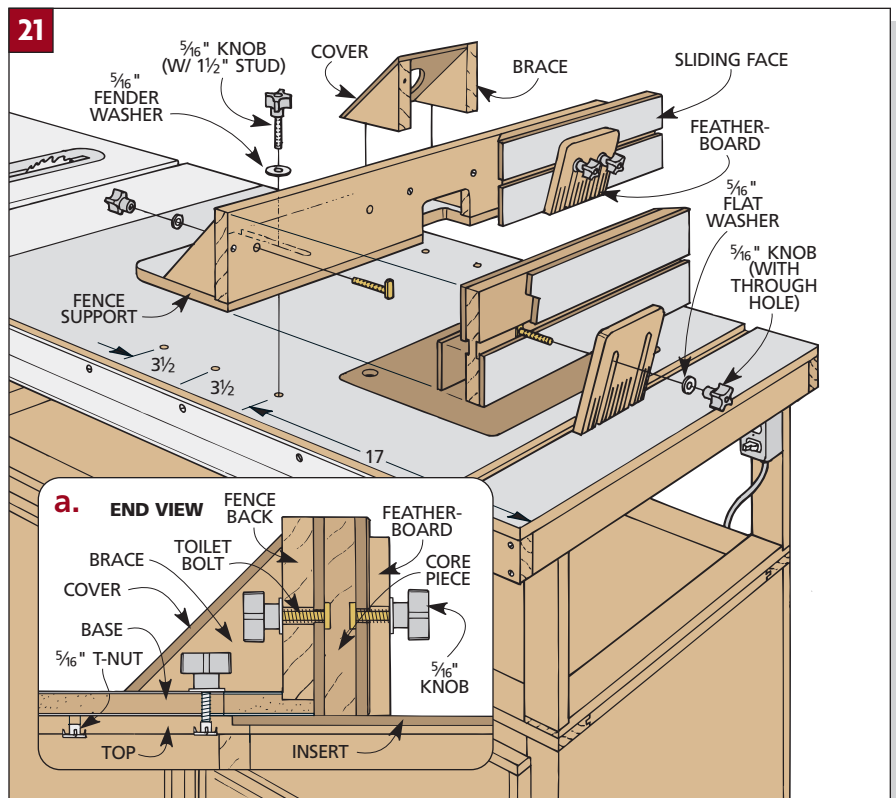
FENCE SUPPORT

To begin, the fence support serves as a mounting surface for the sliding faces. Plus it allows you to adjust (or fine-tune) the fence in relation to the bit.

BASE. To create a stable platform for the fence, I began by making a wide base (XX) from $\frac{1}{2}$ " MDF (*Fig. 22*). It's covered on both sides with plastic laminate.

Note: Besides creating a slick surface that allows the fence to slide smoothly, the plastic laminate covering ensures that the base stays flat.

The next step is to rabbet the front edge of the base to accept a fence back (which is added to the assembly later). I also cut a large notch in the same edge. It prevents the base from getting chewed up by the bit. Also, the notch allows the chips and dust that are produced to be drawn up into a shop vacuum that hooks onto the back of the fence.



ADJUSTMENT SLOTS. To make the fence adjustable, I cut two long slots in the back edge of the base. These slots fit over knobs that thread into T-nuts in the table (*Figs. 21 and 21a*).

To provide a range of adjustment, there are three T-nuts on each side of the table. The best way I found to establish the location of these T-nuts is to center the base on the width of the table. Then mark the centerline of each slot and drill the holes $3\frac{1}{2}$ " apart.

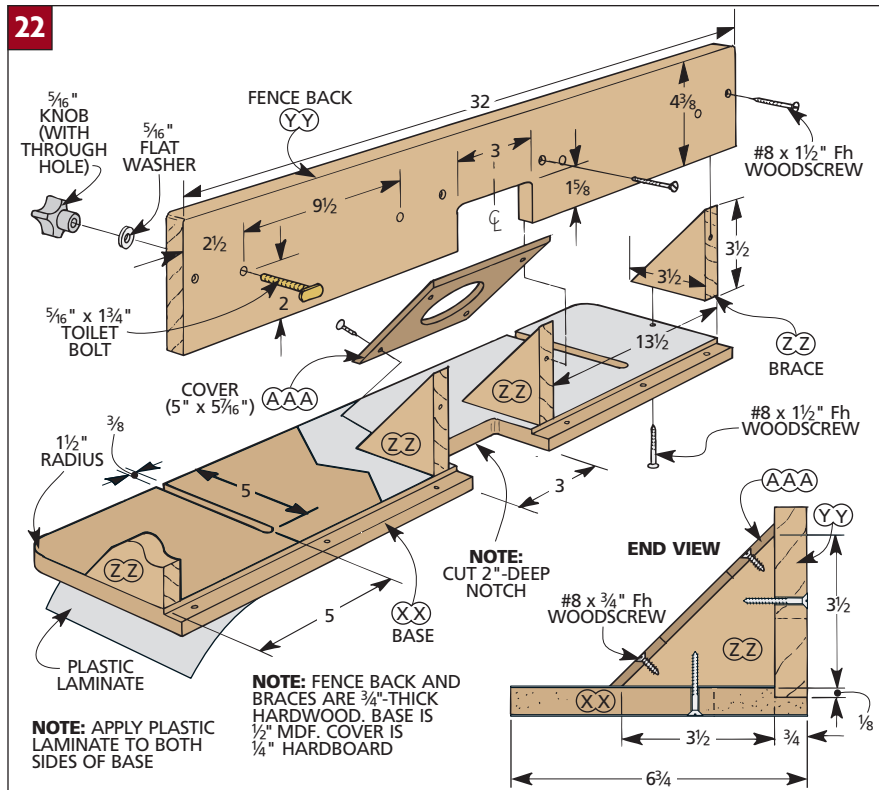
FENCE BACK. After installing the T-nuts, I added a fence back (YY) (*Fig. 22*). It's a wide (tall) piece of hardwood that supports the sliding faces. Here again, there's a notch in the bottom edge for bit clearance and dust collection. Also, to provide a way to attach the sliding faces, I installed four toilet bolts. (The bolts fit into T-slots in back of the sliding faces.)

BRACES. To hold the fence back (YY) square to the base, I added four triangular braces (ZZ). The braces are just pieces of $\frac{3}{4}$ "-thick hardwood that are held in place with screws.

DUST HOOK-UP. Next, to collect saw dust and wood chips, I added a $\frac{1}{4}$ " hardboard cover (AAA). After cutting a hole in the cover for the vacuum hose and beveling the edges to fit against the fence, it's simply screwed to the two braces.

SLIDING FACES

At this point, you can turn your attention to the two sliding faces on the front of the fence. They provide a way to adjust



the size of the opening around the bit. By “closing” the sliding faces around the bit, the end of a workpiece won’t accidentally tip into the opening.

LAYER CAKE. The sliding faces start out as a single blank that’s built up layer by layer like a cake (*Fig. 23*). This makes it easy to form T-shaped slots on both sides of the sliding faces. As I mentioned earlier, the T-slots in back fit over toilet bolts in the fence back. Then the front slots hold toilet bolts that are used to attach two featherboards.

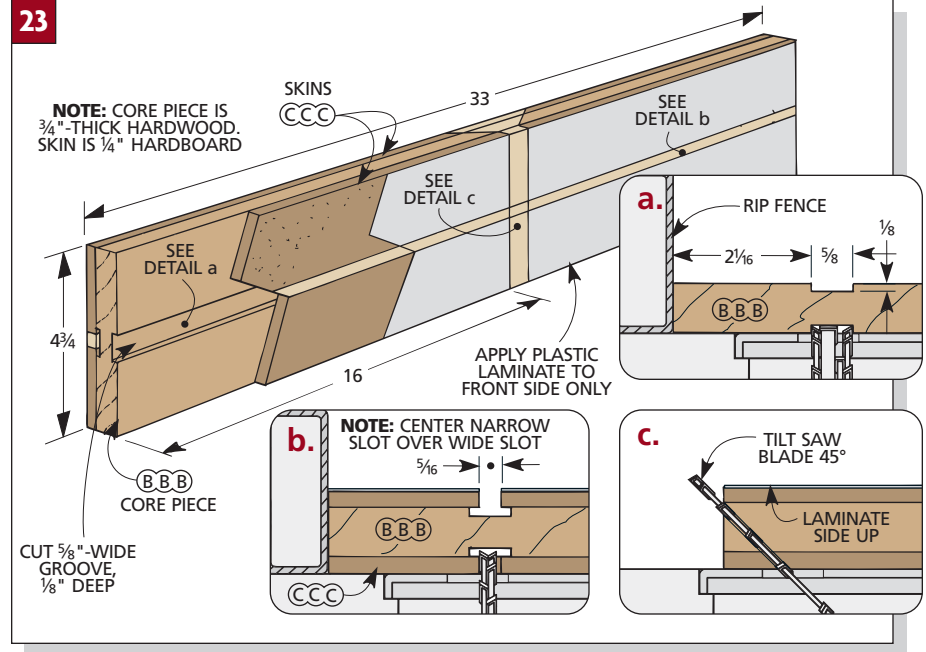
To make the sliding faces, I started with a $\frac{3}{4}$ ”-thick hardwood core piece (BBB) and cut a wide, shallow groove in each side (*Figs. 23 and 23a*). The core piece is sandwiched between two $\frac{1}{4}$ ” hardboard skins (CCC). Also, to create a durable surface on the front of the fence, I glued on a layer of plastic laminate.

Once the layers are all glued on, you can complete the T-slot by cutting a narrow groove in each side (*Fig. 23b*). Now just cross-cut the long blank in two and separate it into two equal-sized parts to form the sliding faces. Then to provide plenty of clearance for large-size bits, I also cut a bevel on the inside end of each face (*Fig. 23c*).

FEATHERBOARDS

To hold a workpiece flat against the table or fence, I made three featherboards.

Each featherboard (DDD) starts off as a $\frac{1}{2}$ ”-thick hardwood blank with both ends mitered at 30° (*Fig. 24c*). To apply downward pressure against a workpiece, there are a number of wood “fingers” on



one end of the featherboard. The trick is to space the fingers evenly.

INDEX PIN. To do this, I used a simple index pin and a wood fence attached to the miter gauge on the table saw. The pin is a piece of scrap that’s the same thickness as the desired spacing of the fingers (*Fig. 24a*). (For mine, this was $\frac{1}{8}$ ”.)

To install the index pin, tilt the saw blade to 30° and cut an angled kerf in the fence. After gluing the pin in the kerf, you’ll need to reposition the wood fence on the miter gauge. The idea is to screw it to the miter gauge so the pin is $\frac{1}{8}$ ” from the blade (the width of a finger).

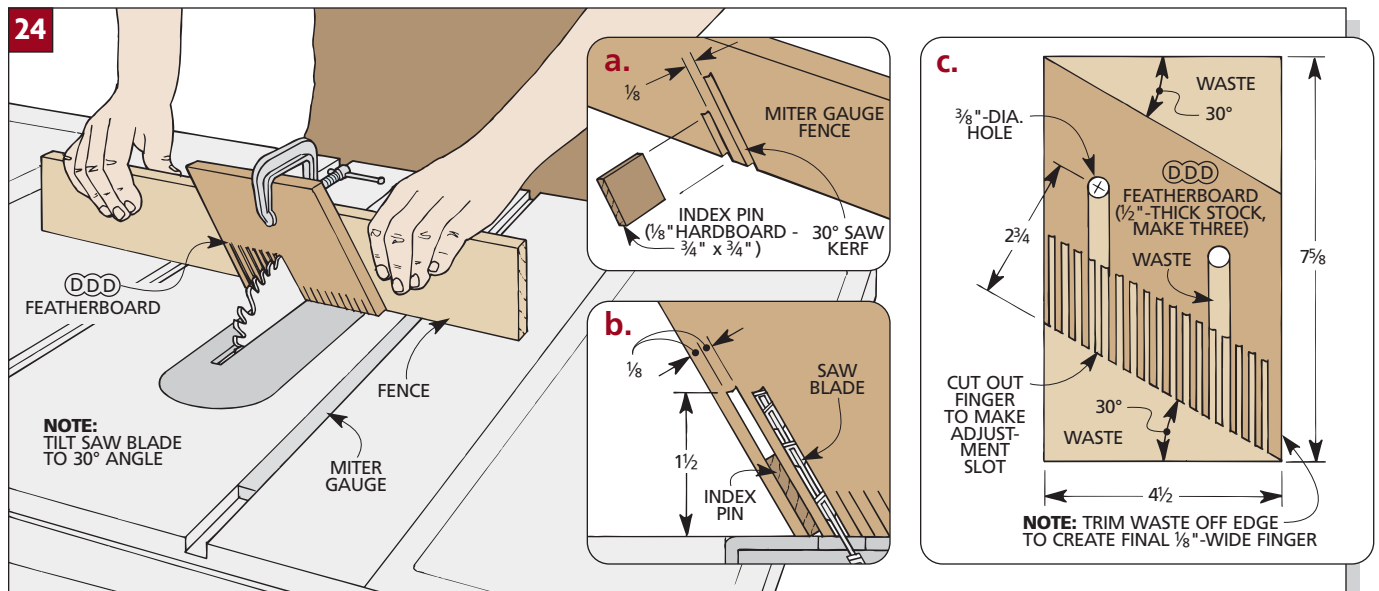
To make the featherboard fingers, start by butting the edge of the blank

against the index pin. Then clamp it to the fence and make a single pass.

Once the first saw kerf is cut, slip it over the index pin (*Fig. 24b*). Then reclamp the blank against the fence and make another pass. To complete all the fingers, just repeat the process.

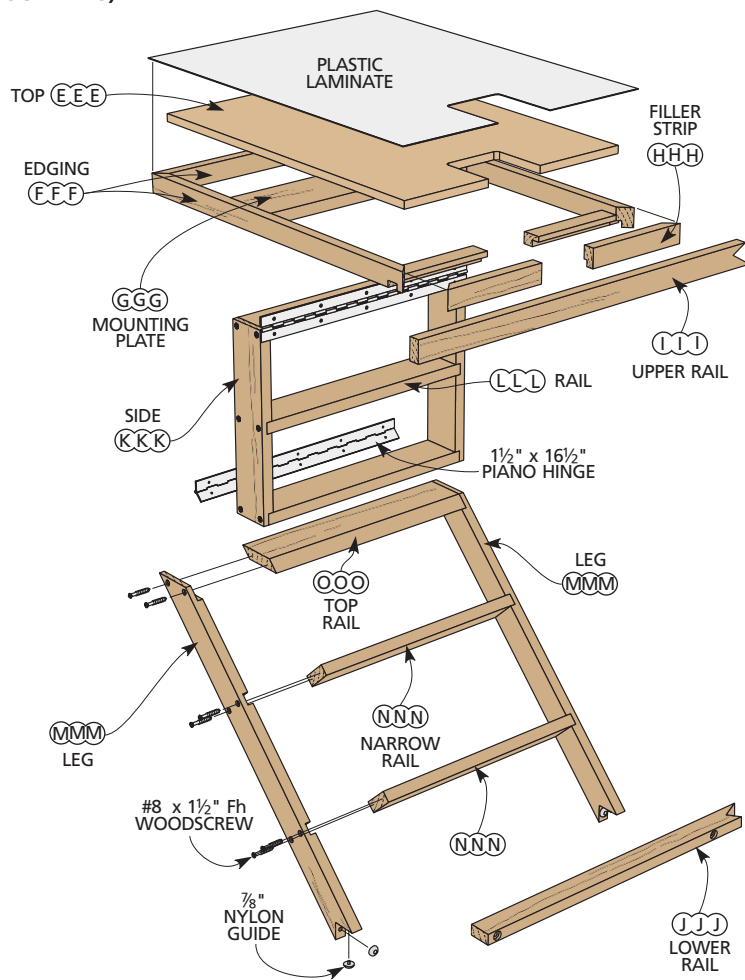
Note: If the last finger on the featherboard is wider than the others, you may need to trim the waste from the edge with the wide finger.

ADJUSTMENT SLOTS. All that’s left to complete the featherboards is to cut two narrow adjustment slots in each one. These slots allow you to raise or lower the featherboards to apply pressure against pieces of different thicknesses.

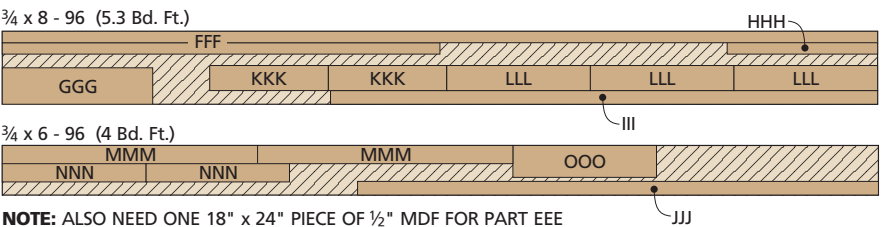


EXPLODED VIEW

OVERALL DIMENSIONS:
18W x 24D x 33¼H
(WITHOUT RAILS)



CUTTING DIAGRAM



MATERIALS LIST

OUTFEED TABLE			HARDWARE SUPPLIES		
EEE	Top (1)	½ MDF - 16½ x 22½	NNN	Narrow Rails (2)	¾ x 2 - 15¾
FFF	Edging	¾ x 1¼ - 144 ln. in.	OOO	Top Rail (1)	¾ x 3½ - 15¾
GGG	Mtg. Plate (1)	¾ x 4 - 16½			
HHH	Filler Strip (1)	¾ x 1¼ - 16½			
III	Upper Rail (1)	¾ x 1½ - 60 rough			
JJJ	Lower Rail (1)	¾ x 1½ - 56½ rgh.			
KKK	Sides (2)	¾ x 2¾ - 13			
LLL	Rails (3)	¾ x 2¾ - 15¾			
MMM	Legs (2)	¾ x 2 - 28 rough			



OUTFEED EXTENSION

To complete the Table Saw Workstation, I built an outfeed extension. Its light weight and fold-up legs make it easy to remove the extension when needed.

Begin work by making the table that “catches” the workpiece as it slides off the table saw. There’s nothing critical about the size of the table. Just be sure it’s large enough to provide adequate support, yet not so big that it’s unwieldy to handle. (I made the table 18” wide and 24” long.)

EXTENSION TOP. The first step is to make the top (EEE) of the table for the outfeed extension (*Fig. 25*). I decided to use medium-density fiberboard (MDF) for the top. It’s a flat, stable material that resists warping. But the thing I liked best is the cost. It’s fairly inexpensive.

What’s the point of using ½” MDF instead of ¾”-thick material? It has to do with the amount of clearance under the table. When the blade on my saw is tilted to 45°, the motor swings up quite close to the table. The extra ¼” of space provides the clearance needed to prevent the motor from hitting the table.

EDGING. After cutting the outfeed tabletop to size, I “wrapped” it with strips of hardwood edging (FFF). Besides covering the exposed edges, the strips add rigidity to the table. They’re simply mitered to length and glued around the top like a picture frame.

PLASTIC LAMINATE. To create a smooth, durable surface, the tabletop (and hardwood edging) are covered with plastic laminate. I glued on an oversize piece of laminate and then trimmed the edges with a router and flush trim bit.

At this point, the top of the table is basically complete. But the bottom still needs some work.

MOUNTING PLATE. To provide a way to attach the angled support, I added a mounting plate (GGG) (Fig. 25). It's just a wide piece of $\frac{3}{4}$ "-thick hardwood that's glued to the table.

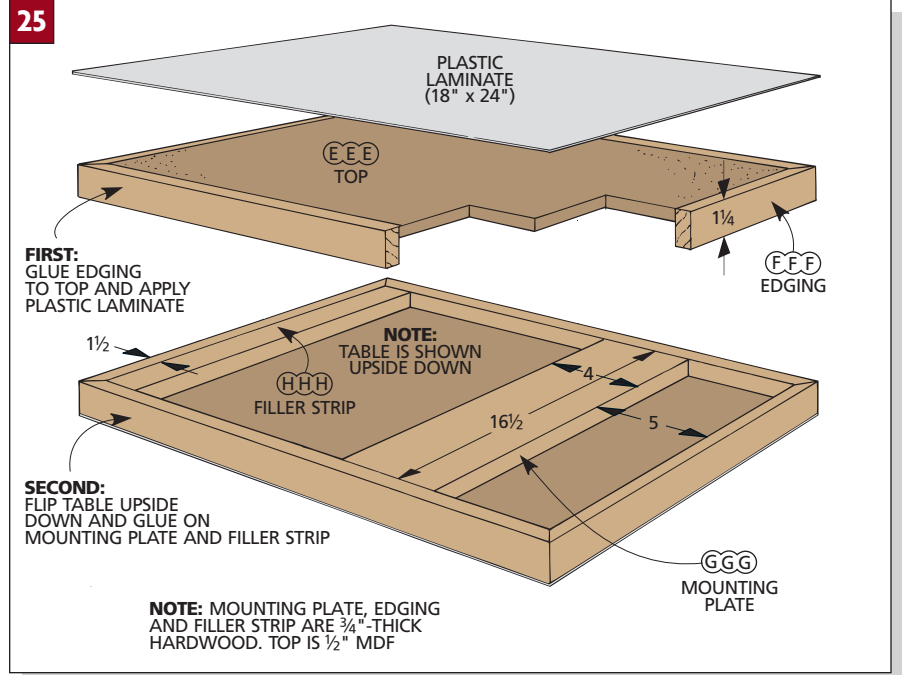
FILLER STRIP. In addition to the mounting plate, you'll also need to glue a narrow filler strip (HHH) to the top. The purpose of the filler strip is to "beef up" the end of the table that hooks over the wood rail on the saw.

RAILS

Now it's time to add to the back of the cabinet the two long rails that hold up the table and the folding support (Fig. 26).

UPPER RAIL. The upper rail (III) is a strip of $\frac{3}{4}$ "-thick hardwood cut to the same length as the metal rail on the saw. (Mine was 60".) To provide clearance for the motor when tilting the blade, you'll need to notch the bottom edge of this rail. (Just cut it in the same location as the notch in the metal rail.) Then simply screw the rail in place.

LOWER RAIL. Next, the lower rail (JJJ) is cut to length to span the full width of the



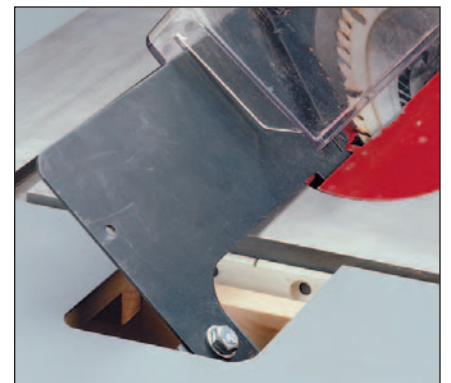
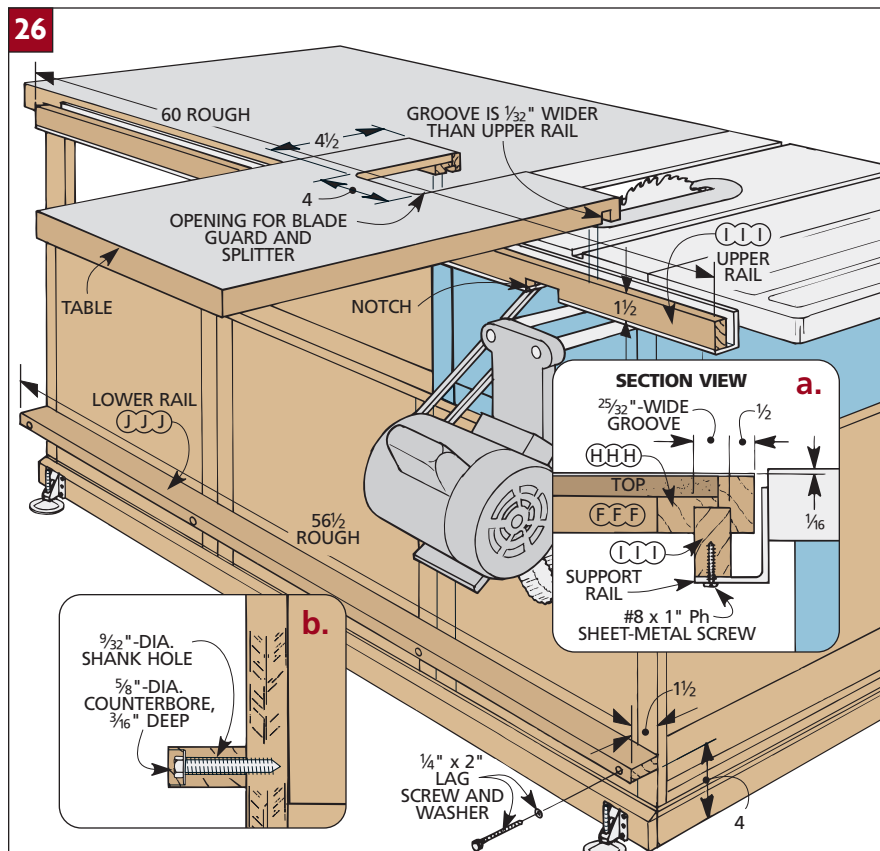
workstation. (Mine ended up being 56 1/2" long.) After drilling counterbored shank holes in this rail, the rail is fastened to the cabinets with lag screws (Fig. 26b).

CUT GROOVE. Now it's just a matter of cutting the groove in the bottom of the outfeed table that hooks onto the upper

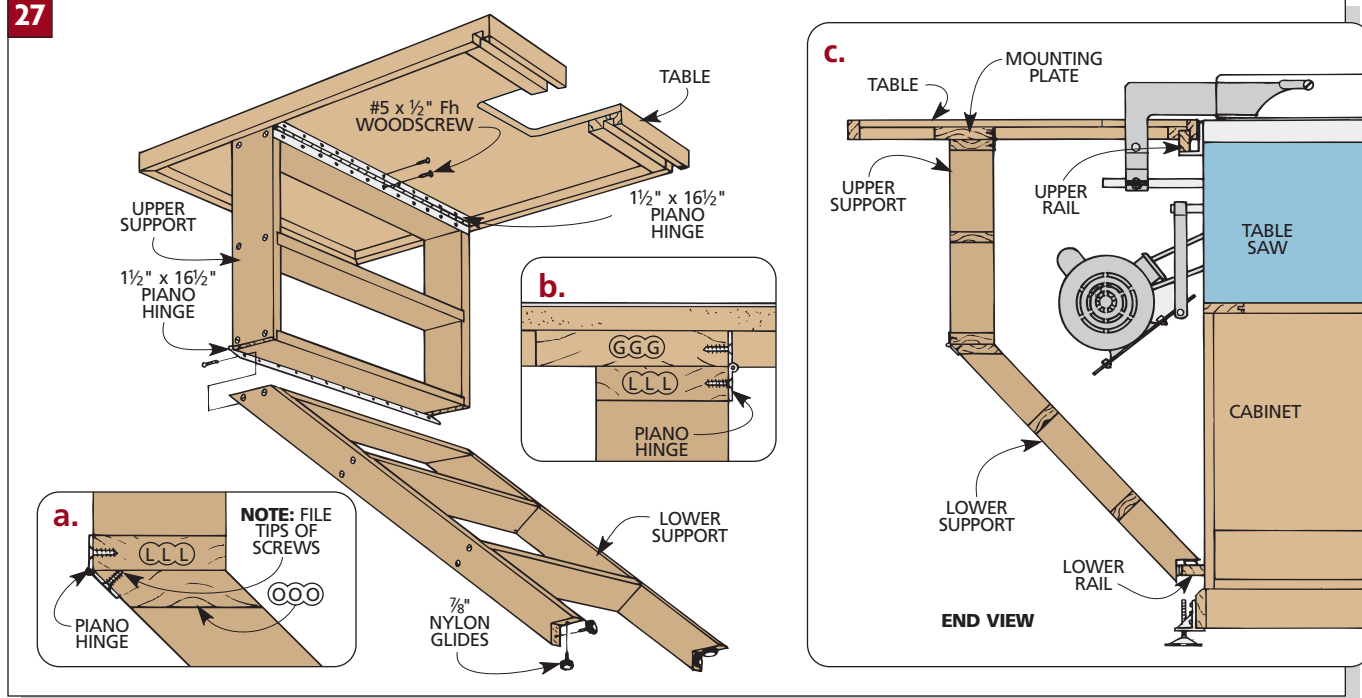
rail (Fig. 26a). The important thing here is the depth of the groove. It should be just deep enough so the table sits about $\frac{1}{16}$ " below the surface of the table saw (Fig. 26a). This way, a workpiece won't catch on the edge of the table.

Another consideration is the width of the groove. The idea is to make it wide enough to create a smooth, sliding fit. To accomplish that, I mounted a $\frac{3}{4}$ " dado blade in the table saw and shimmed it to cut a groove that's slightly wider (about $\frac{1}{32}$ ") than the thickness of the upper rail.

OPENING. Now you can cut the opening (if it's needed) for the blade guard and splitter assembly. This is just a matter of drilling clearance holes in the corners of the desired opening and removing the waste with a jig saw.



A large opening cut from the inside edge of the outfeed table provides clearance for the blade guard and splitter assembly on a contractor's-style table saw.



FOLDING SUPPORT

One of the handiest features of this out-feed table is the angled support that holds it up. It provides sturdy support for the table when ripping a long board and wide pieces of sheet goods. And once you're done, it folds up so you can store the table neatly out of the way.

The folding support consists of two simple wood frames that are hinged together at an angle (Figs. 27 and 27a). An upper support is hinged to the bottom of the table (Fig. 27b). This support is "locked" in a vertical position by a lower support that's propped at an angle against the table saw cabinets.

UPPER SUPPORT

I began by making the upper support. The overall width of this support matches the distance between the edging on the sides of the table. (In my case, this was 16½".) As for height, it needs to extend down far enough so when the lower (angled) support is attached, there's plenty of clearance around the motor (Fig. 27c). (I made it 13" tall.)

The first step is to rip enough ¾"-thick hardwood stock to width to make the two sides (KKK) and three rails (LLL) (Fig. 28). The top and bottom rails fit in rabbets cut in both ends of each side. You'll also need to cut a centered dado in each side to hold the middle rail.

ASSEMBLY. After completing the joinery, the sides and rails are simply glued and screwed together. Then to allow the upper support to fold down, I used a piano hinge to attach it to the table's mounting plate (GGG) (Fig. 27b).

LOWER SUPPORT

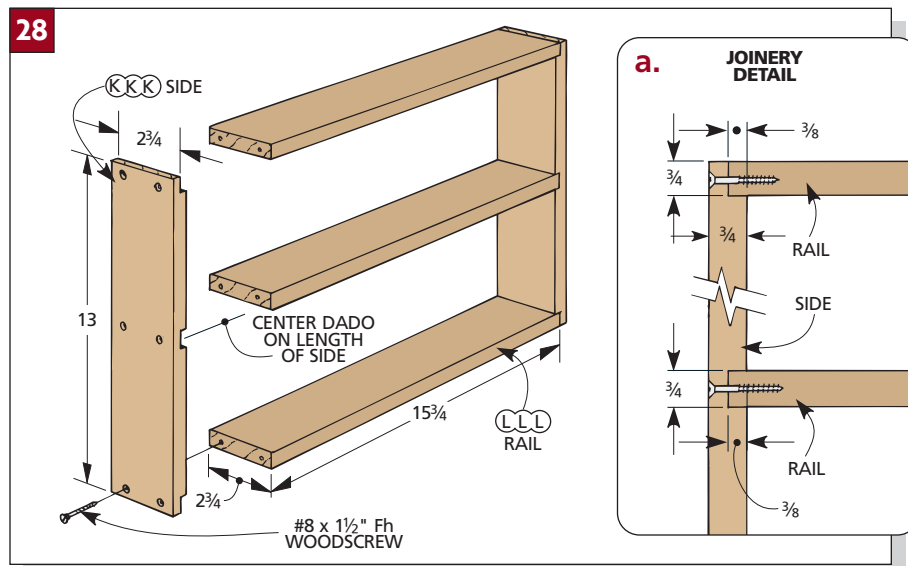
Once the upper support assembly is in place, you're halfway done. Now you can turn your attention to building the angled lower support (Fig. 27).

The lower support is made up of two legs (MMM) that are connected with three rails (NNN, OOO), like rungs on a

ladder (Fig. 30). In use, the legs rest on the lower rail (JJJ) that was attached earlier to the cabinets.

ANGLED NOTCH. To fit the legs on the rail, there's an angled notch in the bottom end of each one (Figs. 29a and 29b). I cut these angled notches in two extra-long workpieces. Later, these notches will provide you with an easy way to lay out the angle on the top end of the legs.

When you cut the notches at the ends of the narrow legs, it will create two pointed tips that are pretty fragile. So I "knocked off" the tips with a block plane to keep them from splintering if the support gets banged around.



NYLON GLIDES. The next step is to add a pair of nylon glides, one on each side of the notch (Fig. 30). These glides make the legs slide smoothly on the lower rail.

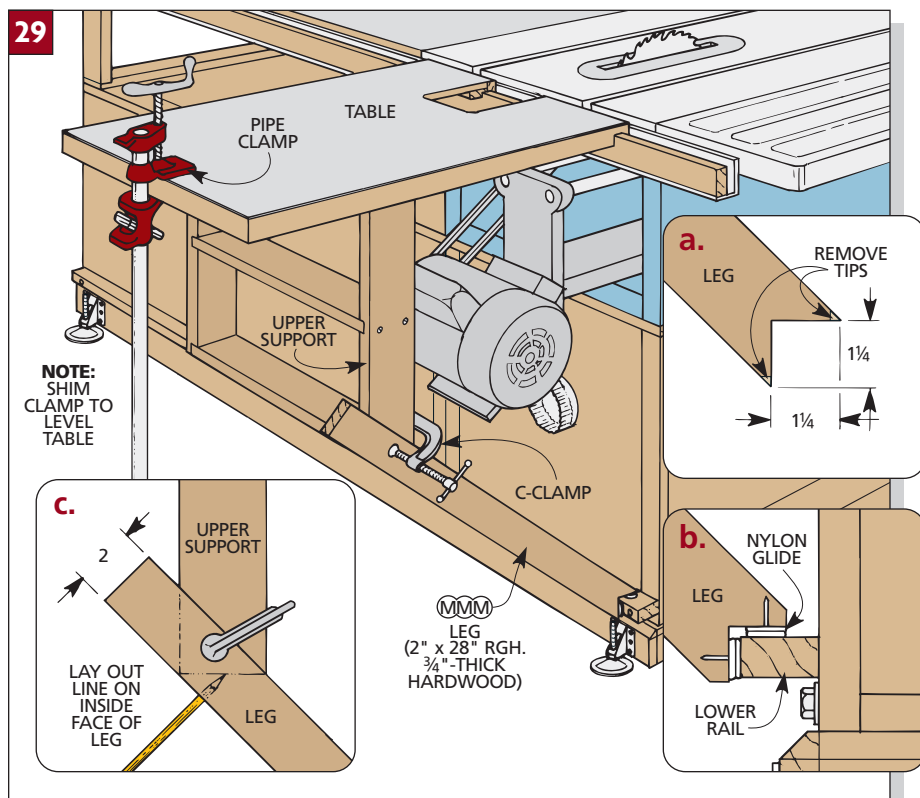
LAY OUT ANGLE. After tacking the nylon glides in place, you're ready to lay out the angle on the top end of the sides. To get accurate results, it's best to temporarily install the support table and then "test fit" one of the legs.

To do this, start by hooking one end of the table over the upper rail and propping up the other end with a bar clamp (Fig. 29). The goal is to make the surfaces of the outfeed table and table saw parallel to each other. So you may need to shim under the clamp.

Now position one of the legs against the upper support as it will be when the table is in use. To do this, set the notched end of the leg on the lower rail and clamp the top end against the upper support (Fig. 29c). Then simply mark the angle across the inside face of the leg.

TRIM TO LENGTH. After laying out the angles on both pieces, you're ready to trim the legs to final length. To do this, tilt the miter gauge on the table saw to match the angle of the layout line on the legs. Then miter the legs to length (Fig. 30).

RABBET ENDS. To accept a wide top rail that's added later, you'll also need to cut a rabbet in the mitered ends of the legs. There's no need to adjust the angle of the miter gauge. I just mounted a dado blade in the table saw and used the same miter gauge setup to rabbet the ends.

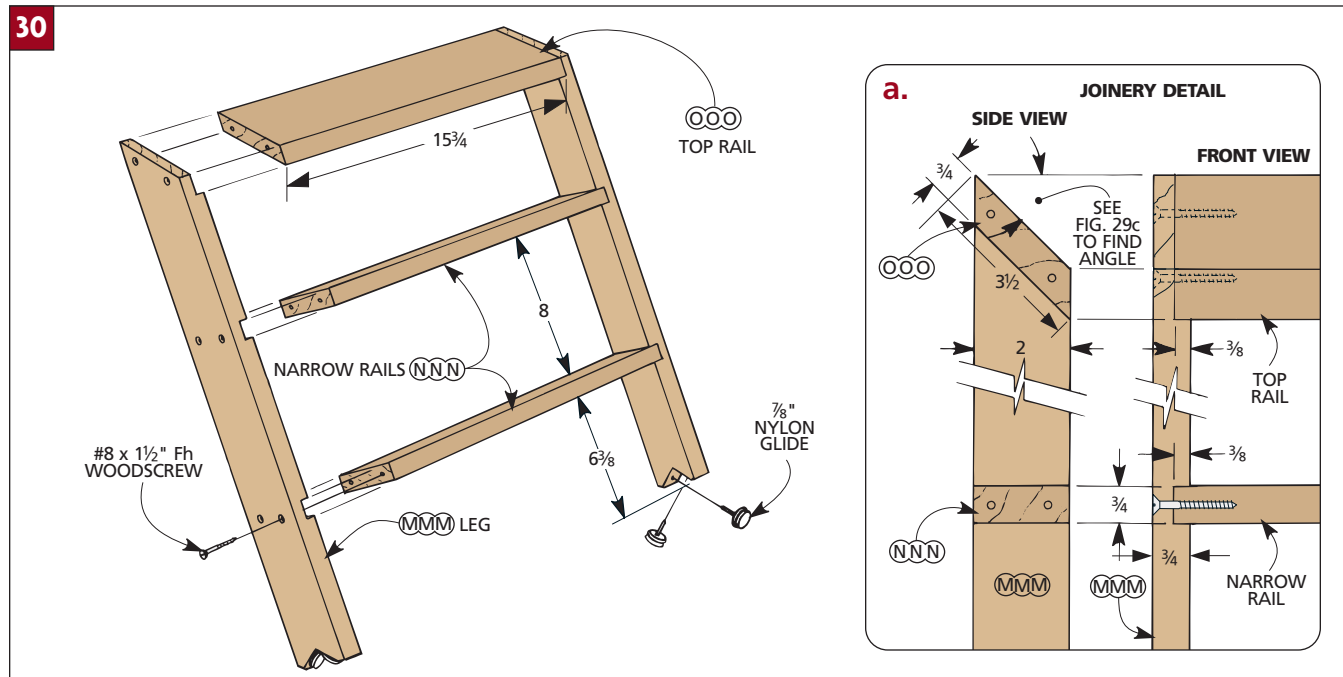


CUT DADOES. The dado blade comes in handy for the next step as well — cutting a pair of dados in each leg to accept the other two rails of the lower support. Only this time, you'll need to rotate the head of the miter gauge back to 90°.

RAILS. At this point, it's time to add the three rails that connect the legs. I ripped two narrow rails (NNN) to match

the width of the legs. And a wide top rail (OOO) fits into the rabbets in the legs. This top rail is beveled on both edges so it fits flush with the legs (Fig. 30a).

ASSEMBLY. Now it's just a matter of assembling the lower support with glue and screws. Here again, I used a long piano hinge to connect the upper and lower supports (Fig. 27a).



SOURCES

Something we take into consideration when designing projects at *Woodsmith* is the hardware. It has to complement the project, and, equally as important, it has to be affordable and readily available.

You should be able to find most of the hardware and supplies for the projects in this book at local hardware stores or home centers. For some of the less common items, you may have to order the hardware through the mail. If that's the case, we've tried to find reputable sources with toll-free phone numbers and web sites (see the Mail Order Sources box at right).

In addition, hardware for several of the projects can be ordered from *Woodsmith Project Supplies* (see box below).

WOODSMITH PROJECT SUPPLIES

At the time this book was printed, the following hardware items were available from *Woodsmith Project Supplies*. For current prices and availability, call toll free:

1-800-444-7527

Router Table

(pages 62-74)

We have 32" lengths of Dual Track and 36" lengths of T-track for the fence. We also offer a ready-made acrylic featherboard.

32"-long Dual Track...No. 7213220

36"-long T-track.....No. 4502076

Featherboard.....No. 4502526

Miter Gauge Fence

(pages 88-95)

The T-track for the fence is available in 32" lengths.No. 4502024

Auxiliary Rip Fence

(pages 96-101)

This kit has all the screws, bolts, nuts, knobs, and washers for the project. You'll need to buy the T-track separately along with the lumber and finish.No. 6860100

Note: The T-track and featherboard listed above with the Router Table will also work with the Auxiliary Rip Fence.

KEY: TL20

MAIL ORDER SOURCES

Some of the most important "tools" you can have in your shop are mail order catalogs. The ones listed below are filled with special hardware, tools, finishes, lumber, and supplies that can't be found at a local hardware store or home center. These catalogs contain many of the supplies needed for the projects in this book.

It's amazing what you can learn about woodworking by looking

through these catalogs. If they're not currently in your shop, you should have them sent to you. Most are also on the web and offer online ordering.

Note: The information below was current when this book was printed. Time-Life Books and August Home Publishing do not guarantee these products will be available nor endorse any specific mail order company, catalog, or product.

THE WOODSMITH STORE

10320 Hickman Road
Clive, IA 50325
800-835-5084

Our own retail store with all kinds of tools, finishing supplies, and hardware for jigs. We can set you up with a T-style rip fence, plus we stock casters, router bits, threaded knobs, pulls, drawer slides, sharpening supplies, toggle clamps, phenolic plates, and lots more. We don't have a catalog, but we do send out items mail order.

ROCKLER WOODWORKING & HARDWARE

4365 Willow Drive
Medina, MN 55340
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www.rockler.com

A very good hardware catalog with a full line of hardware supplies including knobs, pulls, threaded inserts and drivers, hinges, toggle clamps, T-track, and a nice variety of finishing supplies. They also sell router bits, drawer slides, and phenolic inserts.

WOODCRAFT

560 Airport Industrial Park
Parkersburg, WV 26102-1686
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www.woodcraft.com

Just about everything for the woodworker including all kinds of knobs, threaded inserts, swivel casters, hinges, and router bits. In addition, you can find toggle clamps, T-track, drawer slides, and plenty more.

LEE VALLEY TOOLS LTD.

P.O. Box 1780
Ogdensburg, NY 13669-6780
800-871-8158

www.leevalley.com

Several catalogs, actually, with hardware, tools, and finishes. A good source of router bits, rubber bumpers, leg levelers, hinges, sharpening supplies, casters, drawer slides, drawer pulls, and knobs for jigs.

CONSTANTINES

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Ft. Lauderdale, FL 33334
954-561-1716

www.constantines.com

One of the original woodworking mail order catalogs. They carry an extensive line of hardware including toggle clamps, knobs, hinges, pulls, and threaded inserts, plus router bits.

KLINGSPOR'S WOODWORKING SHOP

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800-228-0000

www.woodworkingshop.com

For sanding supplies, this is the place. Also a good source of sharpening and finishing supplies.

CHERRY TREE

P.O. Box 369
Belmont, OH 43718
800-848-4363

www.cherrytree-online.com

They carry the wheels used for the sanding drum on page 25.

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